LIBRARY OF CONGRESS
COPYRIGHT
MAR 7 1887
30711
CITY OF WASHINGTON

PRICE 15 CENTS.

MARCH 5, 1887.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXI. REGULAR EDITION NO. 584.

ARCHITECTURE

ENGINEERING

DECORATION

CONSTRUCTION

TICKNOR & COMPANY

BOSTON • MASS.

CONTENTS.

Editorial Summary.
Early Settler Memorials.—VII.
United States Government Building Practice.—II.
Safe-Building.—XIII.
The use of Mortar during Frost.
Communications.
Notes and Clippings.
Trade Surveys.

ILLUSTRATIONS.

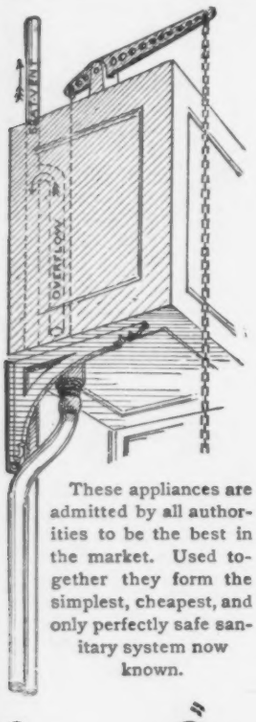
Street in Bremen, Germany.
(Gelatine Print issued only with Imperial Edition.)
Church, Philadelphia, Pa.
House, Richmond, Va.
Old Colonial Work,—Details from King's Chapel, Boston, Mass.
House at Fox Hill, near Philadelphia, Pa.
Design for a Country House.
Doorway at Charlieu, France.

THE CELEBRATED

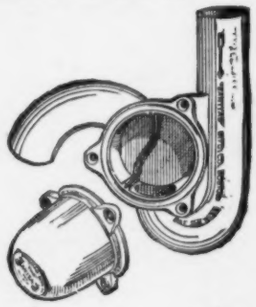
SANITAS

PLUMBING

APPLIANCES.



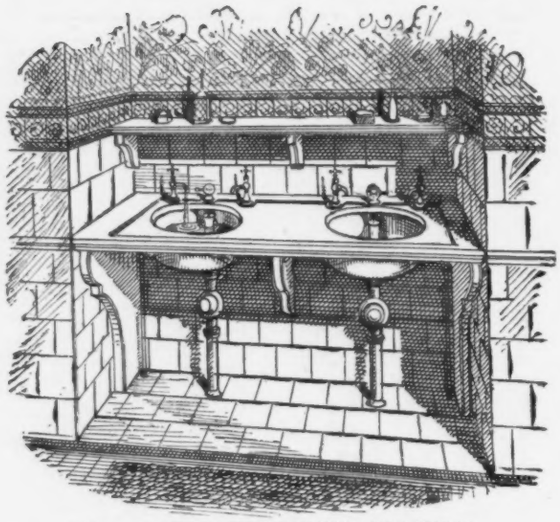
These appliances are admitted by all authorities to be the best in the market. Used together they form the simplest, cheapest, and only perfectly safe sanitary system now known.



"SANITAS" TRAP OPENED.

The Sanitas Trap, whether vented or unvented, has shown itself when properly set to be capable of resisting indefinitely, siphonage, back-pressure, and all other adverse influences met with in plumbing.

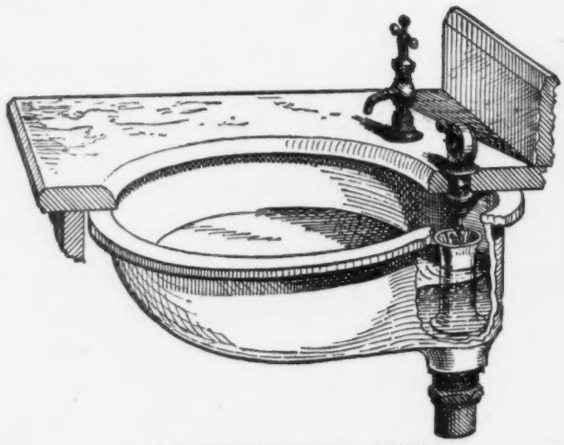
The "Sanitas" Basin flushes out the pipes and keeps them clean.



THE "SANITAS" WASH-BASINS AND TRAPS.
Set in Tile-work

THE "SANITAS" MFG. CO.

THE "SANITAS" WATER-CLOSET.

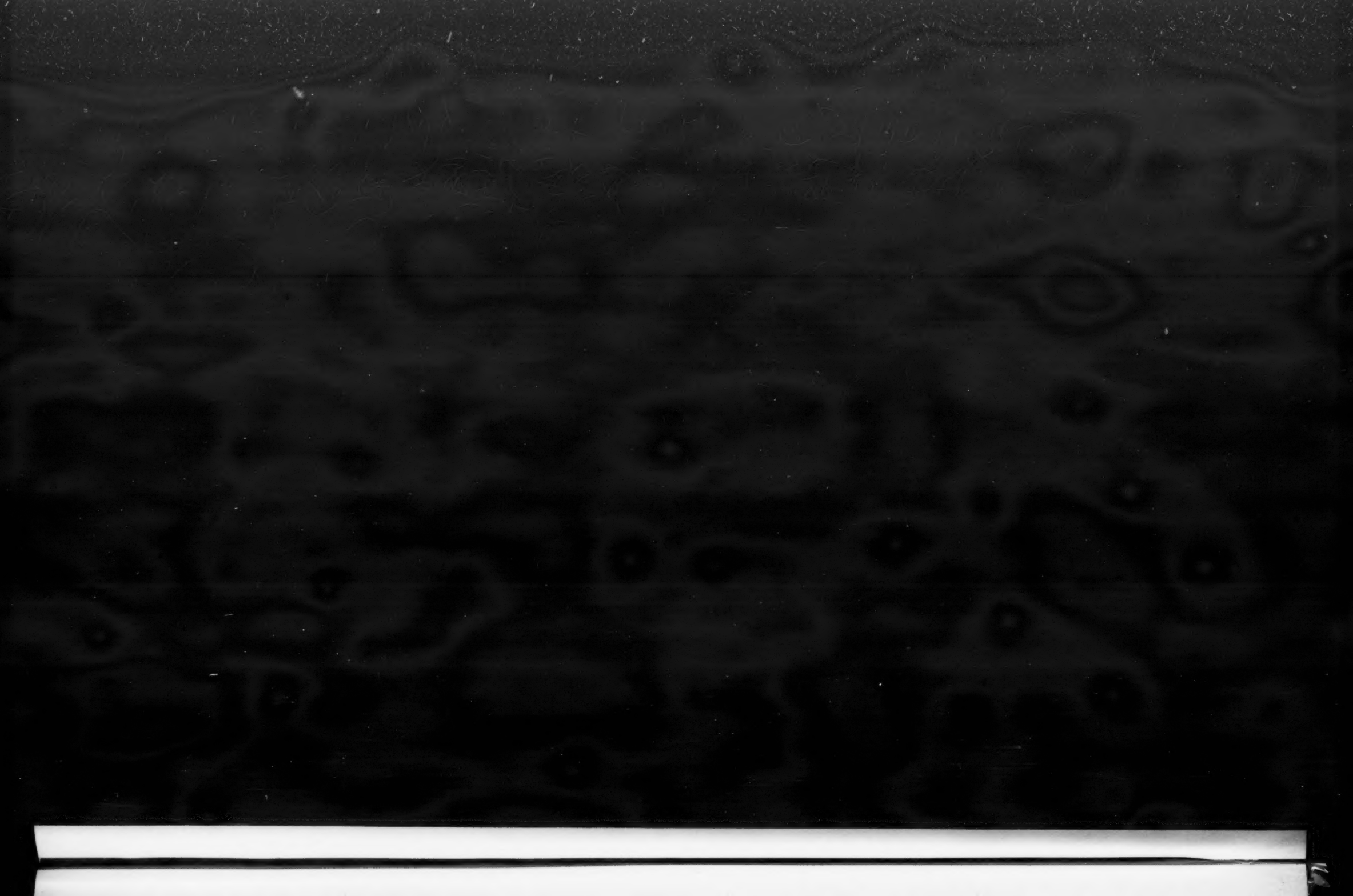


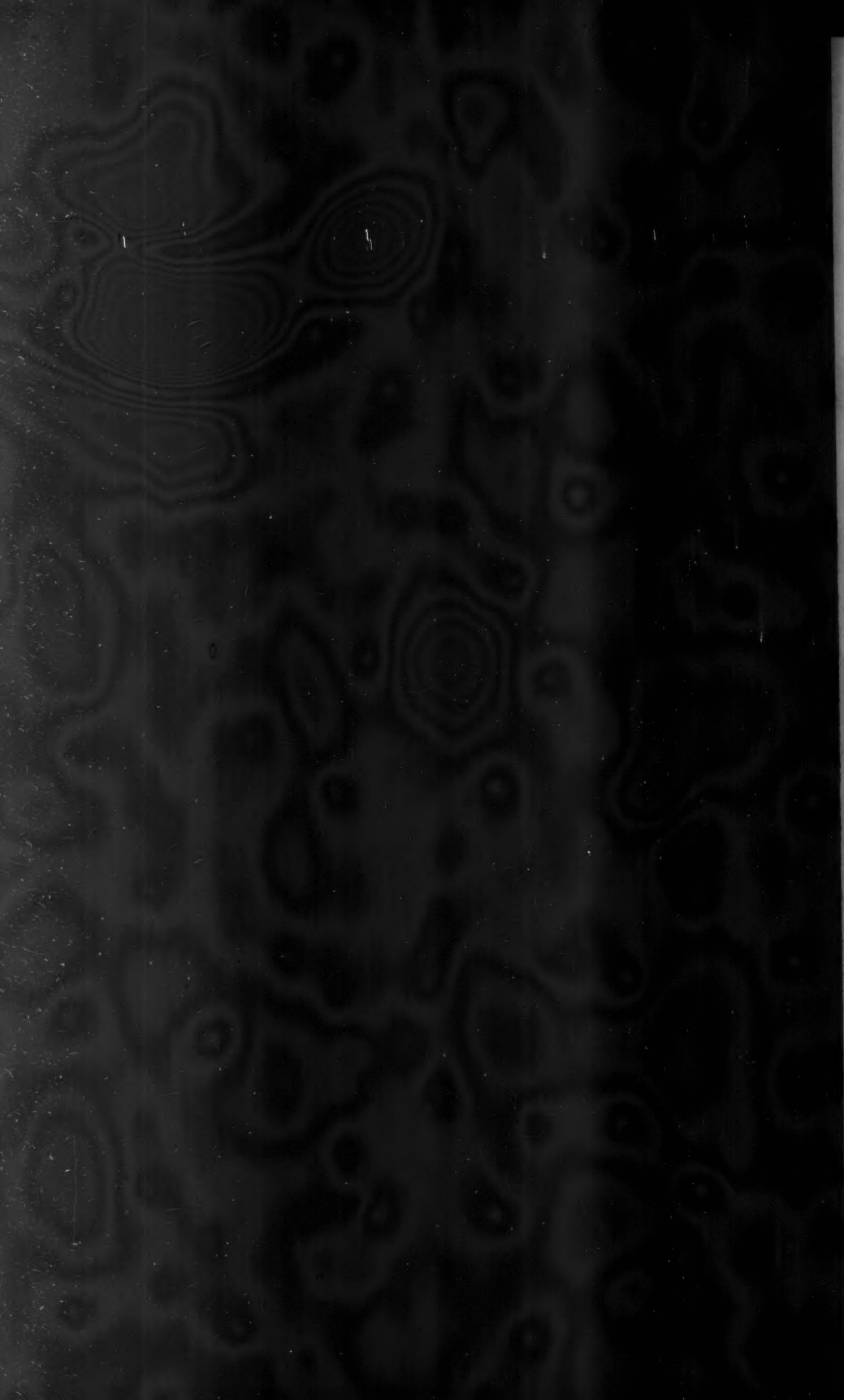
THE "SANITAS" WASH-BASIN.

("SANITAS" BATH-TUB and PANTRY-SINK on same principle as Basin.)

THE "SANITAS" MANUFACTURING CO., BOSTON, MASS.

T. H. DUGGAN, 141 Dartmouth Street, BOSTON, MASS. TELEPHONE, 4165. Will execute anywhere, in first-class manner, small or large contracts for PLUMBING





THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXI. Copyright, 1887, by TICKNOR & COMPANY, Boston, Mass. No. 584

MARCH 5, 1887.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

SUMMARY: —
An Architect's Suit for Commission on Interrupted Work — Profit-sharing, *vs.* Trades-Unionism; the Case of S. H. Williams, a New York Contractor. — French Laws governing the Hours of Labor.—Failure of the National Workshop System at Paris.—Regulating the Hours of Labor of Children.—The Adirondack Water-supply System. — The Strikes. . . . 109
EARLY SETTLER MEMORIALS. — VII. . . . 111
THE ILLUSTRATIONS: —
A Street in Bremen, Germany. — Park Avenue M. E. Church, Philadelphia, Pa. — House, Richmond, Va. — Old Colonial Work: Details from King's Chapel, Boston, Mass. — House at Fox Hill, near Philadelphia, Pa. — Design for a Country House. — Doorway at Charlieu, France. . . . 114
UNITED STATES GOVERNMENT BUILDING PRACTICE. — II. . . . 114
SAFE BUILDING. — XIII. . . . 115
THE USE OF MORTAR DURING FROST. . . . 117
COMMUNICATIONS: —
"Safe Building–Correction. — The Weight of Stored Merchandise–Flat Roofs. — Metropolitan Improvements. — Safety-plug for Water-backs. — To find the Bevel of Hip-rafters. . 118
NOTES AND CLIPPINGS. . . . 119
TRADE SURVEYS. . . . 120

WE are able, by the kindness of the gentlemen concerned, to give some interesting particulars in regard to the case of an architect's claim for compensation for work which he was engaged to do, but was prevented by the other party from doing, which was decided at Albany not long ago. The architect, or rather, the firm in question, was employed to prepare sketches, in accordance with certain instructions, for a house to cost something less than seventeen thousand dollars. This work was done, and the sketches submitted and approved, and an order given to prepare working-drawings, specifications and details, and procure estimates for the work. Two days later notice was sent by the client to proceed no further with the work, but to send a bill for what had already been done. The architects replied that they should insist upon the fulfilment of the agreement by which they were employed to complete their services as far as the procuring of estimates, and would claim compensation for any damages which they might suffer from their abrupt dismissal; and, as their estimate of the value to them of the work done, and the damage which they incurred by the non-fulfilment of the agreement, they presented a claim for five hundred and fifty dollars. The referee found from the evidence that the architects had been employed, as they claimed, to prepare working-drawings, specifications and details, besides the sketches which they had already made, and to obtain estimates; and that they were ready and willing to do so, but were prevented by their client. He found also that the value of their services in making the sketches was one per cent on the proposed cost of the building, and that the value of their services in making working plans, specifications and details, and in obtaining estimates, would have been two and one-half per cent on the estimated cost; and he found also that out of this two and one-half per cent the architects would have had to pay about one per cent for expenses, which they saved by not actually doing the work; so that the net profits of the architects, or, as we should rather say, the value of their own services in doing the work for which they were employed, exclusive of the sketches, would have been two hundred and fifty dollars. Under the rule which governs in mercantile cases, he who violates a contract is liable for all the direct and proximate damages which result from such violation; and the true measure of damages is held to be the profits under the contract which would remain after deducting the actual cost of performing it; and the referee saw no reason why the same rule should not prevail in regard to the employment of architects; and judgment was therefore given for four hundred and seventeen dollars and fifty cents, this being three and one-half per cent on the proposed cost of the building, less the estimated expense to the architects of making the working-drawings, specifications and details, and obtaining estimates.

MR. LEWIS H. WILLIAMS, the New York contractor who transgressed the principles of trades-unionism by paying his men what they were worth, and by giving them a share in the profits of his business, has been savagely persecuted ever since by the union authorities. Finding that his men preferred a good income, and hope for the future, to slavery and the precarious living of people whose daily bread may be taken from them at any moment by the whim of a walking-delegate, they tried to break up the pleasant and confidential relations existing between the contractor and his employés by ordering those of the latter who were members of the union to quit their work. One or two of the nervous ones, remembering the terrible weapons which the secret committees of the unions can use against those who disobey them, followed the delegate's call, and left their work, but soon plucked up courage to return again, in defiance of the threats of their would-be masters. Finding the persons immediately concerned thus contumacious, the union officials proceeded to attack Mr. Williams by means of the vile conspiracies to which they have accustomed the public. Through the agency of the Central Labor Union, all framers, bricklayers and other mechanics engaged in building trades were forbidden to do any work whatever in buildings where Mr. Williams had contracted for the carpenter-work. With the help of this sort of proscription, more ruinous in its effects on a contractor's business than a papal excommunication would be to his spiritual comfort, the delegates believed that their victim would be brought to terms, and they congratulated themselves on having got the better even of his determination. Mr. Williams, however, although one of the quietest of men, possesses a resolution which those who have tried it most severely can best understand, and some six weeks have passed since the whole power of the building trades was put forth against him, without the appearance of any sign of surrender on his part. Although he must himself bear the principal losses which the trades will inflict upon him, he has been at least somewhat cheered by the cordial and sincere sympathy of the men who will suffer with him. A few days ago, they contributed out of the small income which their brethren, under the lead of a few revengeful delegates, are trying so successfully to reduce, about three hundred dollars, which they invested in a handsome testimonial, consisting of a portrait of Mr. Williams, executed in India ink, with an inscription expressing "the warm personal esteem" and the "very high appreciation" of the carpenters in his employ, not only on account of "his kind and liberal demeanor toward them," but for "his earnest and effective efforts for the general advancement of the moral and physical condition of his employés, furnishing an example eminently worthy the emulation of all the employers of the land." Such a testimonial as this, coming, not after a period of prosperity and general self-congratulation, but in a time of severe disappointment and adversity, is about as precious a possession as a man could well have; and if the unions should rob Mr. Williams of his last cent, they cannot take away from him the consciousness, which he will value more than a fortune, of having succeeded in inspiring those of his fellow men who depended most upon him with such true gratitude and affection.

M. ALFRED RENOUARD, the Secretary of the Northern Industrial Society of France, has made a study of the French laws relating to hours of employment, which promises to be of great service to persons interested in the amelioration of the condition of working people, particularly as he accompanies his statements of fact with some very suggestive comments. The immediate occasion of the publication of his notes is the demand which has been lately made that the Government shall, by decree, limit the number of working hours in the day; some reformers arguing that eleven hours should be the maximum number, while others prefer ten, and the anarchist section of the Workingmen's Congress, held last summer in Paris, pronounced itself in favor of eight hours. The present law in France, which restricts the working day to twelve hours, dates from 1848, and has a somewhat curious history. So long ago as 1776, many reforms were made in the laws relating to labor; the privileges of the trade corporations were abolished, and the practice of the manual arts thrown open to all who could attain the necessary skill in them. At the same time, the question of restricting the number of working hours was considered, perhaps, as in our own day, in the light of the theory that if men worked fewer hours, their work would last longer, and more would be employed; but Turgot, the great minister of finance, put an end to the discussion, declaring that the privilege of laboring for himself and his family

was the most sacred and inviolable right that a man possessed and that he did not consider himself, even as the king's minister, justified in meddling with it in any way. This declaration produced a strong impression, and it was not until 1841 that, through the effect of the serious industrial changes produced by the introduction of machinery, and the collection of great numbers of operatives in manufactories, complaints began to be made in regard to the sufferings of working people, which reached the ears of the Government, and a commission was sent to investigate the matter. The accumulated evidence, much of which was collected and effectively set forth in a book on the subject, by Adolphe Blanqui, showed that in many industries the operatives were greatly overworked, fourteen hours being, in some manufactories, the regular working day. The Government of Louis Philippe was quite ready to devise a remedy for this state of things, but, before anything was done, the Revolution of 1848 took place, and the victorious heroes of the barricades assumed the direction of public affairs. These, finding the papers in regard to the matter among the other unfinished business of the late Government, solved the difficulty by one of those happy inspirations which serve cheap politicians in place of common sense, and ordained that, as the health of certain working people had been injured by working fourteen hours a day, thenceforth no person should work more than ten hours a day in Paris, or eleven hours in the rural districts.

THIS decree was received with consternation by employers and employed alike. Certain manufactures could not be carried on at all with only ten hours attention a day; and many others, which were compelled at once to conform to the new law and meet the competition of the free English and German establishments, languished and died, and the workmen, thrown out of employment, filled the air with their complaints. The wiseacres of the barricade government had already experienced a second inspiration. They had established national workshops in Paris, carried on at the tax-payers' expense, in which the starving work-people should be employed, and in less than three months a hundred and six thousand operatives from the ruined provincial factories applied for work at the national establishments. The national workhouses could only receive a portion of them, and the rest, in despair, betook themselves to barricades and violence, from which they were themselves the worst sufferers. The Constituent Assembly, which by this time had succeeded the provisional government, took immediate action upon the matter which had become so important, and, after collecting the opinions of the Provincial Chamber of Commerce, as well as the local officials all over the country, decided to extend the legal working-day to twelve hours, making exception later, however, in favor of dye-houses, sugar manufactories, printing-offices, foundries, rolling-mills, glue and soap-factories and many other establishments, in which the hours of labor might be extended either indefinitely, or to the number of thirteen or fourteen.

IN practice, this law has now become almost a dead letter, through the number and variety of the legalized exceptions to it; and the efforts of the commissions, which, at rare intervals, have of late years been appointed to see whether it was observed, have been gradually turning to the collection of information in regard to the protection of children from overwork in factories, instead of the men to whom the original decree referred. As has been often observed, the improvement in the design and adjustment of machinery have now made it possible for children to do a great deal of the work which, forty years ago, could only be done by stronger persons, and the factories which were once exclusively occupied by men are now filled with girls, women and young children. As M. Renouard well says, the State, which should avoid interfering with the freedom of action of grown men, is exercising a perfectly legitimate function in defending the feeble and helpless against the tyranny of stronger persons who happen to be in a position to abuse their authority; and the laws for the industrial protection of women and children have of late years been made very stringent in France, and are executed with the vigor characteristic of statutes supported by a unanimous popular sentiment. Although the slavery of young people in factories was never so revolting in France as in England, children seven years old are said to have been kept at work sixteen and seventeen hours a day in the woollen mills of Elbeuf, and eighteen hours in the little silk-weaving shops of Lyons, until a statute was passed which repressed these abuses without mercy; and since then commissioners appointed for the purpose have kept close watch of all manufactories where young persons are employed, sixty-one thousand establishments, employing more than two hundred and forty thousand young girls and children, having been inspected in 1885. As the statute now stands, no child less than twelve years old is allowed to work in any factory whatever; no girl or woman of any age is allowed to work in a mine; no child can be employed in any shop for working horn, bone, pearl, celluloid or other substances which yield a deleterious dust or are liable to explosion, or in any manufactory of carbolic acid, chlorine, or other noxious chemicals; and no girl less than eighteen years old can work in rag-picking shops, which are, in the opinion of the inspectors, insufficiently ventilated. Children more than twelve years old are permitted to work at any of the occupations not entirely prohibited to them for time not exceeding twelve hours a day, provided they are given an interval of rest at noon; but no boy under sixteen, and no girl under twenty-one is allowed, under any circumstances to work in a factory after nine o'clock at night, or before five in the morning, or at any time on Sunday. In the interior of factories it is permitted to employ boys or girls over twelve years old to drag hand-carts or trucks, provided that the transportation is done on a level surface, and that the load, including the weight of the hand-cart or truck, does not exceed two hundred and twenty pounds; but no boy less than fourteen, and no girl less than sixteen, can draw trucks or hand-carts in the public street. In Austria and Switzerland, the working day consists of eleven hours, with certain exceptions, and in the latter country no child under fourteen can be employed in any factory, and no one under eighteen is allowed to work nights or Sundays.

A GREAT scheme, which has been studied for years by the persons interested, with the assistance of the best experts, has now been so far considered in detail as to warrant an application to the Legislature of the State chiefly concerned for authority to carry it out. This scheme is nothing less than a plan for bringing water from the Adirondack Mountains, by an aqueduct through the Hudson valley, to supply not only New York and Brooklyn, but the towns and cities along the river. If we are not mistaken, the credit of the completed plan is due to Mr. Fanning, the engineer consulted by the projectors, whose interesting book, describing the work to be done, is familiar to the profession. It is intended to take the supply from the head-waters of the Hudson River, just where the stream leaves the mountains, forming a reservoir by means of a dam, which will be three hundred and eighty-five feet above tide-water, and two hundred and twenty-five miles from New York. From this reservoir an open canal, sixty feet wide, and perhaps eighteen feet deep, will take a thousand million gallons of water a day, which will be enough to supply Troy, Albany, Hudson, Poughkeepsie, Yonkers and the other important cities on its course, with an ample surplus for New York, Brooklyn and the suburban towns. The cost of the undertaking is estimated at sixty million dollars, which is less than that of the aqueduct that supplies Vienna, and the capacity of the canal will be five times that of the Vienna aqueduct, while the Hudson conduit will have the advantage of being utilized by a large population along its route, who will not only be glad to have the pure mountain water, but will pay enough for it to swell materially the dividends of the private corporation which now asks permission to carry out the plan.

WHERE is a good omen for the building business of the country in the collapse of all the great strikes which have been provoked over the country by the officials of the labor associations, who, apparently, had no object in view except to make a display to the world of their newly-acquired power. In New York seventy-five thousand men are said to have been thrown out of work at once, at the dictation of the leaders whom they had sworn a solemn oath to obey, but who, apparently knew as little as their victims, and cared a good deal less, about the cause which they professed to have undertaken to defend. It seems to us that it is quite time for the law to step in, to protect innocent persons from being ensnared by union rules into a blind servitude to men who, even if sincere, are not often capable of judicious leadership; and the imposing of oaths of any kind upon citizens by anything but the public authority might with great advantage be made a criminal offence.

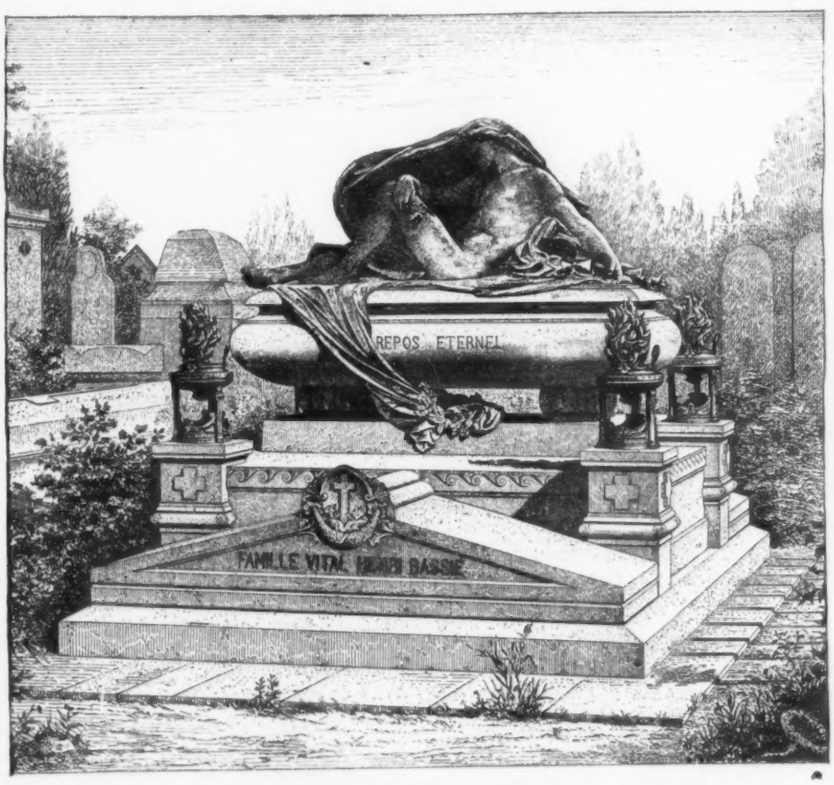
EARLY SETTLER MEMORIALS.—VII.[1]

FIRST MONUMENT TO GENERAL JOSEPH WARREN.

Monument to Gen. Warren on Bunker Hill, 1794.

SO far as we know, the earliest public monument erected to a revolutionary hero was that to the memory of General Joseph Warren. On the 14th of November, 1794, King Solomon's Lodge of Masons, of Charlestown, Mass., voted "that Brothers Josiah Bartlett, John Soley, Eliphalet Newell, William Calder and David Stearns be a committee to erect a monument in Mr. Russell's pasture (provided the land can be procured), such as, in their opinion, will do honor to the Lodge, in memory of our late brother, the Most Worshipful Joseph Warren; that they be authorized to draw upon the treasurer to defray the expenses of the same; and that when the monument is finished, they report their doings to the Lodge."

Honorable James Russell offered a deed of as much land as might be necessary for the purpose; and so active were the committee, and so earnest in carrying out the patriotic purpose for which they were appointed, that the next month (December, 1794) a special meeting of the Lodge was called to hear their report. They reported that they had erected a plain Tuscan pillar, built of wood, eighteen feet in height, exclusive of the pedestal, which was two feet high and eight feet square. This pedestal was afterward raised to eight feet in height, the better to protect the monument, and was built of brick and stone. The top terminated in a gilt urn, bearing General Warren's initials and age within the square and compasses. The whole was fenced around to protect it from injury. The total cost of the structure was, according to the committee's report and as stated in the records of the Lodge, not far from $500. But, according to the correspondence between the committee of the Lodge and the Bunker Hill Monument Association, in regard to placing a model of the original monument in the present structure, it appears that the total cost was not far from $1,000.



Tomb in the Cemetery at Bordeaux, France. M. A. Jouandot, Sculptor. M. Boussard, Architect.

The following inscription was placed upon the southwest side of the pedestal, engraved upon a tablet of plate, 16 x 26 inches:

ERECTED A. D. MDCCXCIV.
By King Solomon's Lodge of Freemasons,
Constituted at Charlestown, 1783,
In memory of
Maj.-Gen. JOSEPH WARREN
And his associates who were slain
On this memorable spot, June 17, 1775.

When the pedestal was raised to a height of eight feet, the following additional inscription was placed upon it:

"None but they who set a just value
upon the blessings of Liberty
are worthy to enjoy her."
"In vain we toiled; in vain we
fought; we bled in vain—
If you our offspring
Want valor to repel the assaults
of her invaders."
Charlestown settled 1628; burnt
1775; rebuilt 1776;
The enclosed land given
By Hon. James Russell.

The monument was dedicated with imposing ceremonies, December 2, 1794.

On March 8, 1825, a committee was appointed to make a present of the land and monument to the Bunker Hill Monument Association. Some time between this date and May 10, of the same year, the remains of the structure were demolished, for on that date it is recorded that a committee was appointed to investigate the matter.

When the original monument and the land were presented to the Monument Association, an assurance was given to the Lodge that some trace of the existence of the former structure should be preserved in the new monument. At first it was intended to place a marble tablet, suitably inscribed, in the interior of the present monument; but later this plan was changed, and it was decided to substitute a miniature model of the original monument, Accordingly, an exact model was constructed of the finest Italian marble. Including the granite pedestal on which it stands, it is about nine feet in height.

This model is placed on the floor of the inner chamber of the well room of the present obelisk, directly in front of the entrance. In addition to the original inscriptions, which had been faithfully copied, the following was engraved on the model:

"This is an exact model of the first monument erected on Bunker Hill, which, with the land on which it stood, was given, A. D. 1825, by King Solomon's Lodge of this town to the Bunker Hill Monument Association, that they might erect upon its site a more imposing structure. The Association, in fulfilment of a pledge at that time given, have allowed, in their imperishable obelisk, this model to be inserted, with appropriate ceremonies, by King Solomon's Lodge, June 24, A. D. 1845."

The anniversary of St. John the Baptist, June 24, 1845, was selected as the day on which "to commemorate this last offering to the memory of those who were slain on the ever memorable 17th of June, 1775."

The stone tablet upon which was inscribed the inscription of the old monument, and a section of the original shaft, are now in possession of King Solomon's Lodge.

THE WARREN STATUE.

The marble statue of General Warren, which stands in the building at the base of Bunker Hill Monument, originated in the suggestions of Col. T. H. Perkins, a public spirited citizen of Boston, in 1850. In a communication to the Bunker Hill Monument Association, of which he was a member, he offered to give a thousand dollars in aid of the project, and at the same time recommended for consideration Mr. Henry Dexter, of Cambridgeport, as a sculptor fully competent to undertake the work.

The committee appointed by the Association recommended that the subscription be opened for a statue, and that a memorial be addressed to Congress, praying that an appropriation in aid of it be made by way of executing the resolve of the Continental Congress, passed April 8, 1777. As this resolve contemplated the erection of "a monument to General Warren, in the town of Boston," it was thought advisable, in order to secure the appropriation from Congress, to propose that the statue should be placed in Faneuil Hall, should the City Government of Boston consent to receive it.

The memorial was presented to Congress in 1850, and re-presented for several successive years, but with no report upon the subject. The committee therefore decided, in 1854, to carry on the work by private effort, and accepted Colonel Perkins's suggestion by commissioning Mr. Dexter to execute the work. They also decided to place the statue on Bunker Hill, as Congress had failed to discharge the honorary obligation imposed upon it by the resolve of 1777. A temporary building was accordingly erected, near the monument, and the statue unveiled on the 17th of June, 1857. It is of white Italian marble, seven feet high, and cost five thousand and fifty dollars. It

[1] Continued from page 65, number 580.

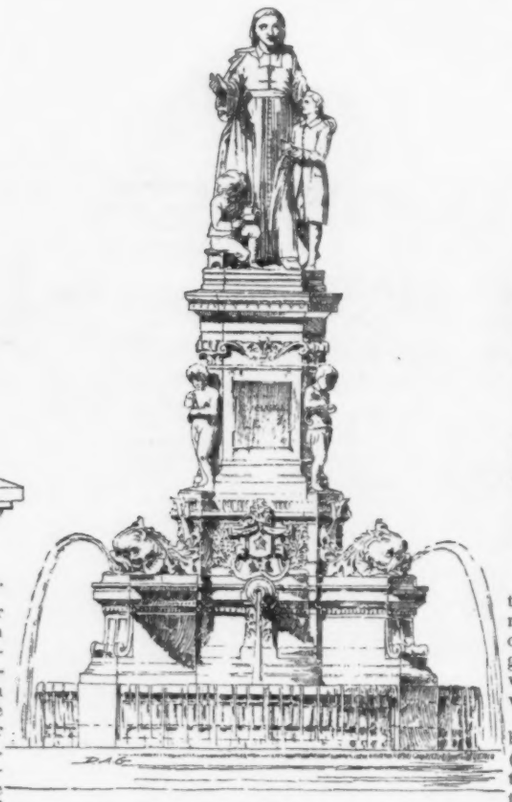
stands upon a pedestal of Vermont verd antique marble, presented by the heirs of Dr. John C. Warren, of Boston.

The ceremonies attending the inauguration of the statue and the celebration of the eighty-second anniversary of the battle of Bunker Hill, were of the most imposing military and civic character. Edward Everett delivered the address of presentation of the statue, George Washington Warren the address of reception, and John T. Heard, the Grand Master of the Grand Lodge of Masons, the address of inauguration. Among the soldiers present was Benjamin Smith, a veteran of ninety-four years, who was a fifer for three years in the Revolutionary War. Mr. Everett, in his address, spoke of the sculptor as "a meritorious and self-taught American artist;" and of the statue, that it would be alike superfluous and indelicate to enlarge upon its merits in the presence of its sculptor and that of his work — a commendable piece of self-restraint.

THE PROPOSED NEW MONUMENT TO WARREN.

The Joseph Warren Monument Association was chartered by the State of Massachusetts in 1873. The site for the proposed structure is a triangular piece of ground, opposite the stone house belonging to the Warren family, on Warren Street, Boston. The house occupies

The Warren Statue Henry Dexter, Sculptor.



Monument to J. B. de la Salle at Rouen, France.

Proposed Monument to Red Jacket.

the site of General Warren's former residence. The ground was given by the City of Boston, and the committee on the monument have procured twenty bronze cannon from Congress, with which to make the statue. The selection of a design for the monument devolved upon Mr. L. Foster Morse, a well-known real-estate agent, who accepted the one made by Mr. Alfred A. Combe, of the Smith Granite Company, of Rhode Island.

It is proposed that this company shall execute the work. The following amusingly exact yet utterly unintelligible description of the design, has been given to the public through the press:

"The monument will be thirty-four feet seven and one-half inches in height, and will cost twenty thousand dollars. The pedestal will be twelve by ten feet, and five feet in height; the plinth seven by five feet, and two feet in height; the shaft proper, three feet ten inches square at the top, and nine feet in height. This will be surmounted with scroll-work frieze, and a capstone four and one-half feet square. On this will be placed a statue of General Warren, in bronze, facing toward the head of Warren Street, the right arm uplifted and the left hand clasping a roll of parchment. The statue represents the General as wearing a loose cloak, thrown back from the right shoulder, and top-boots. There are to be on the four faces of the plinth, in low relief, the following inscriptions: Front, 'The Battle of Bunker Hill'; rear, 'In honor of Joseph Warren, major-general of Massachusetts Bay. He devoted his life to the liberties of his country, and in bravely defending them he fell, an early victim, in the battle of Bunker Hill, June 17, 1775.' On the side facing the site of the old Warren homestead, now occupied by the dwelling of Dr. A. H. Nichols, will be a representation of the old homestead; on the west side will be represented Warren as he appeared delivering his celebrated oration in the pulpit of the Old South Church on March 5, 1774."

Although subscriptions have been solicited from the public to help pay for this monument, the design has not been publicly exhibited, nor is it the intention of those having it in charge to exhibit it until the monument becomes an established fact.

In times past there has been a good many unsatisfactory proceedings connected with the erection of public monuments and statues in Boston, and the results have not been more satisfactory. This is the first time that a perfectly new and congruous programme has been laid out. No artist known to the public, as such, is connected with the project. The selection of a design is left to one person, who is also unknown as possessing the qualifications for fulfilling such an important trust; and the execution of the monument is given to a company without reputation as art producers. Withholding the design from public view is a fitting completion to the programme. No surprise has been expressed at the presentation of this scheme, though the question has been asked as to whether persons owning real estate in the immediate vicinity of the selected site were desirous of having forever before their eyes a structure of such doubtful antecedents. No greater reflection could be made upon the taste of those most interested in the progress of monumental art in Boston than the entire character of this programme. A programme no higher, from an art point of view, than that which resulted in the Cogswell fountain.

The present Congress — 1885-86 — has been asked to carry out the Resolve of 1777 (before mentioned), and it is believed that ten thousand dollars will be received from that source, and it is proposed to raise, by subscription, fifteen thousand dollars.

MEMORIALS OF RED JACKET.

Red Jacket died in 1830, and on his death-bed said, in parting with his Christian wife: "When I am dead it will be noised about through all the world. They will hear of it across the waters and say, 'Red Jacket, the great orator, is dead.' Clothe me in my simplest dress, put on my leggins and my moccasins, and hang around my neck the cross I have worn so long, and let it lie upon my bosom; then bury me among my people. Your minister says the dead will rise. Perhaps they will. If they do, I wish to rise with my old comrades; I do not wish to rise with the pale faces; I wish to be surrounded by red men."

He was buried amid the graves of his brother chiefs, in the Seneca Mission burying-ground in East Buffalo, New York, a locality once occupied by an ancient Indian fort, and of which the lines of entrenchment could be distinctly seen as late as 1842.

"A little to the north of the principal entrance was the grave of the celebrated chief, Red Jacket, so long the faithful friend and protector of his people against encroachments of the whites, and still, as we might imagine, the watchful sentinel, solemnly guarding this little spot, where so many of his chosen friends recline around him, from the desecrating touch of the race whom he had so much reason

to fear and hate. No stones mark the graves of these primitive nobles. In the summer of 1839, Henry Placide, the actor, while on a visit to Buffalo, determined that Red Jacket's grave should no longer remain undistinguished. A subscription was set on foot under his auspices, and the result was the erection of a handsome marble slab over his last resting place, bearing the following inscription:

SA-GO-YE-WA-THA,
(HE KEEPS THEM AWAKE)
RED JACKET.
CHIEF OF THE
WOLF TRIBE OF THE SENECAS.
THE FRIEND AND PROTECTOR OF HIS PEOPLE,
DIED JANUARY 20, 1830,
AGED 78 YEARS."

By 1852, this stone "had been chipped away to half of its original dimensions by relic hunters and other vandals. The cemetery had become the pasture ground for vagrant cattle, and was in a scandalous state of dilapidation and neglect." The legal title to the grounds had passed into the possession of a land company, though the Indians were led to believe that the church grounds and the cemetery were excluded from its operation. In the above year, "George Copway, the well-known Ojibwa lecturer, delivered two or more lectures in Buffalo, in the course of which he called attention to Red Jacket's neglected grave, and agitated the subject of the removal of his dust to a more secure place, and the erection of a suitable monument. A prominent business man, the late Wheeler Hotchkiss, who lived next the cemetery, became deeply interested in the project, and he, together with Copway, assisted by an undertaker named Farwell, exhumed the remains, and placed them in a new coffin, which was deposited with the bones in the cellar of Hotchkiss's residence."

The principal men of the few Senecas still living discovered that the old chief's grave had been violated, almost simultaneously with its accomplishment. Two of them, with a party of excited white sympathizers, repaired to Hotchkiss's residence, and demanded that the remains should be given up. The request was complied with, and the bones were taken to Cattaraugus, and placed in the custody of Ruth Stevenson, the favorite step-daughter of Red Jacket, and a sister of Daniel Two Guns, one of the Senecas who obtained the remains from Hotchkiss. Ruth preserved the remains in her cabin for some years, and finally buried them, but resolutely concealed from every living person any knowledge of the place of sepulture.

Silver Medal Presented to Red Jacket in 1792 by order of Gen. Washington.

"On the evening of the 29th of December, 1863, the late Chief Strong, by invitation of the Young Men's Christian Association, delivered a lecture in the city of Buffalo, the theme of which was Red Jacket. He concluded with an eloquent appeal, addressed to his white brethren, to rescue the remains of Red Jacket, and other eminent chiefs from threatened profanation, and bury them in Forest Lawn Cemetery. A few of the concluding sentences of the address were as follows:

"'I stand before you now in the last hours of a death-stricken people. A few summers ago our council-fires lighted up the arches of the primeval wood, which shadowed the spot where your city now stands. Its glades rang with the shouts of our hunters and the gleeful laugh of our maidens. The surface of yonder bay and river was seamed only by the feathery wake of our bark canoes. The smoke of our cabins curled skyward from slope and valley.

"'To-night! To-night! I address you as an alien in the land of my fathers. I have no nation, no country, and, I might say, I have no kindred. All that we loved, and prized, and cherished is yours. The land of the rushing river, the thundering cataract and the jewelled lakes are yours. All these broad blooming fields, those wooded hills and laughing valleys are yours — yours alone. There is one boon we would ask of you. Gather up tenderly the bones of Red Jacket, Corn-planter, Young King, Pollard and their brother chieftains, and bury them in yonder cemetery, where the plow of the husbandman will not invade their repose. There, in sight of their own beautiful river, and under the shadow of the trees they loved so much, our sachems will sleep well.

"'Within the limits of this city, the great orator once said, "But an evil day came upon us. Your forefathers crossed the great waters, and landed on this island. Their numbers were small. They found friends, not enemies. They told us that they had fled from their own country for fear of wicked men, and had come here to enjoy their religion. They asked for *a small seat*. We took pity on them, and granted their request, and they *sat down* amongst us. We gave them corn and wheat."

"'Brothers of the pale race: We crave now, in our turn, but 'a small seat' in yonder domain of the dead!'"

Although Strong's appeal deeply affected his audience, moving many of them to tears, the project was allowed to slumber until 1876, when Mr. William C. Bryant, a member of the Buffalo Historical Society, visited the Cattaraugus Reservation, and laid the matter before the Council of the Seneca Nation, which was then convened there. The assembled chiefs voted their unqualified approval of the project.

Ruth Stevenson, by reason of increasing age and anxiety in regard to the future of the bones of Red Jacket, finally delivered them into the custody of the Buffalo Historical Society, which, with the approval of the Council of the Seneca Nation, agreed to provide a permanent resting place for the old chief and his compatriots. The remains of Red Jacket were accordingly received from their aged custodian in 1879, and deposited in the vault of a bank, until their final sepulture in Forest Lawn Cemetery, in October, 1884.

What was left of the gravestone erected by Placide was placed in the rooms of the Historical Society.

In the spring of 1884, the Society made arrangements for the re-interment of the remains of Red Jacket, and those of other chiefs still resting in the Mission Cemetery. Five of the skeletons of the exhumed chiefs were identified as those of Young King, Destroy Town, Captain Pollard, Tall Peter and Little Billy. Several other skeletons were identified, and many could only be designated in the re-interment as the "undistinguished dead." The trustees of Forest Lawn generously gave to the Historical Society a large and conspicuous plot for the purpose of burial. A public subscription was solicited to cover the expenses of the Society incurred in the re-interment and the erection of a monument. It was generously responded to by the citizens of Buffalo.

The ceremony of re-interment, which took place on the 9th of October, 1884, under the auspices of the Society, was one of the most interesting, memorable, and singularly suggestive, in the history of the dead in this country. Rare indeed, is it, that any organization is so fortunate, can crown itself with so humane an honor, as that which will ever distinguish this Society. The procession from the rooms of the Society to the cemetery was witnessed by an immense crowd of people. The bones of Red Jacket, and those of five other chiefs were severally placed in a polished oak casket. The pall-bearers were Indians, and the services were conducted according to their custom. Thirty-six Indians, representing eight different tribes, took part in the ceremony. Dirges and chants were sung in Indian language, a wampum belt, that had been preserved by the Seneca Nation for over two hundred years, was displayed, and addresses were made by eminent pale faces and Indian chiefs.

Chief John Buck, the hereditary "keeper of the wampum belts," sang in long, low, mournful tones the following chant in the Onondaga language:

"Now listen, ye who establish the Great League,
Now it has become old —
Now there is nothing but wilderness,
Ye are in your graves who established it —
Ye have taken it with you, and have placed it under you.
And there is nothing left but a desert.
There you have taken your intellects with you,
What ye established ye have taken with you,
Ye have placed under your heads what ye established,
The Great League."

Then the other chiefs joined in the chorus as follows:

"Woe! Woe!
Hearken ye!
We are diminished!
Woe! Woe!
The clear land has become a thicket.
Woe! Woe!
The clear places are deserted.
Woe! Woe!
They are in their graves —
They who established it —
Woe!
The Great League.
Yet they declared,
It should endure —
The Great League.
Woe!
Their work has grown old.
Woe!
Thus we are become miserable."

On the evening of October 9 commemorative exercises were held in music, in the presence of three thousand people. The Society contemplates re-interring the tenants of graves in other neglected Indian burial grounds. The 8th of October was also notable from the fact that the first general council of the united Iroquois which had been held since the Revolutionary War, took place on that day.

It is generally believed by white men who heard Red Jacket speak

that he was the most eloquent of all Indian orators. He was noble in person, dignified in demeanor, and impressive in his voice and gesture. Though some of his tribe were Christians, he would have nothing to do with anything of the kind. His most famous speech was made at a council of Seneca chiefs and warriors, held in Buffalo, in 1805, assembled at the request of a missionary from Massachusetts, Mr. Cram. The missionary spoke first, saying the things that are usually uttered by Christian ministers to savages. After he had done speaking, the Indians conferred together about two hours, by themselves, when they gave an answer by Red Jacket. At the close of his speech he said, "As we are going to part, we will come and take you by the hand, and hope the Great Spirit will protect you on your journey, and return you safe to your friends." When the Indians drew near to take the missionary by the hand, he would not receive them, telling them "that there was no fellowship between the religion of God and the works of the Devil, and, therefore, could not join hands with them." The Indians smiled and retired.

Red Jacket once said to a clergymen who was importuning him on the common participation in the guilt of the crucifixion, "Brother, if you white men murdered the Son of the Great Spirit, we Indians have nothing to do with it, and it is none of our affair. If he had come among us, we would not have killed him, we would have treated him well. You must make amends for that crime yourselves."

MONUMENT TO RED JACKET.

The proposed monument to Red Jacket and his brother chieftains was designed by Hon. Elias S. Hawley. It is in the form of a hexagon, one side for each of the six nations: Mohawks, Oneidas, Tuscaroras, Onondagas, Cayugas and Senecas. The pedestal will be thirty feet high, built of granite, and the statue of Red Jacket, in bronze, ten feet high. The base stone, immediately under the die, will have on each of its sides a bronze bas-relief representing a scene from Indian life — the chase, the council, the battle, wigwam scenes, etc., while the cap will be decorated with Indian ornaments, utensils and weapons of warfare. The estimated cost of the entire monument is ten thousand dollars. The first base has been put in its place, and a polished granite headstone marks the old chief's last resting-place. The inscription, written by the designer of the monument, is as follows: —

Red Jacket,
[Sa-go-ye-wa-tha]
the
Resolute Champion
of a wronged and hapless
People,
The Inspired Orator,
"The Rienzi of the
Iroquois,"

Died at Buffalo Creek,
January 20, 1830.
Aged 78.

"When I am gone and my warnings no longer heeded, the craft and avarice of the white man will prevail. My heart fails me when I think of my people, so soon to be scattered and forgotten."

"Who, then, lives to mourn us?
None!"
"What marks our extermination?
Nothing!"

The quotations are Red Jacket's own words.

If the beautiful tribute paid to the memory of these famous sons of the forest by the Historical Society is a glory to be remembered and an honor to itself, the completing and far more significant event in its programme is the erection of the proposed monument. It is given to monuments to tell the most lasting and universal human story. They close the list of the great events of a people; they are the immortal mile-stones that carry to posterity the last breath of dead nations. "Show me your monuments and I will tell you what you are" is an expression whose authority history has never questioned. No more signal or completely representative subject for a monument can be found in the entire history of the red man than that which the society proposes to consider. It includes an unusually singular and impressive element, one that should be respectfully regarded, in the fact of Red Jacket's persistent isolation as a representative of a race that had no interests in common with its white destroyer. He expressed it with his last breath: —

"I wish to rise with my old comrades. I do not wish to rise with the pale faces; I wish to be surrounded by red men."

The idea of the proposed monument, a structure that rises into the air rather than spreading out on the ground, is a good one; but the way it is planned, as shown in the illustration, makes it in every way objectionable. The statue of the great sachem ought to be an important, if not dominating, part of the monument. As it is, it is ludicrously subordinate. To make such an Indian, with his positive and distinct phases of character, the meek displayer of a bow and tomahawk, is indeed pitiful. The short inscription is drawn out over a perpendicular distance of ten feet. There are too many words about the design. Illustrations alone, no matter what their subjects may be, do not make monuments. It is to be hoped that before the society proceeds with its purpose, it will give the subject of design more careful study.

T. H. Bartlett.

[To be continued.]

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

A STREET IN BREMEN, GERMANY.

[Gelatine Print, issued only with the Imperial Edition.]

PARK AVENUE M. E. CHURCH, PHILADELPHIA, PA. MESSRS. HAZLEHURST & HUCKEL, ARCHITECTS, PHILADELPHIA, PA.

THE perspective shows the design awarded first premium in a competition for the new building of the Park Avenue M. E. Church. It has a frontage of eighty-five feet on Norris Street, and seventy-five feet on Park Avenue, connecting with the old chapel. The materials used are Trenton brown-stone, trimmed with Euclid stone; the roof is of slate, except tower and corner octagon, which are of red tile. The windows are subdivided by stone tracery. As shown on the plan, the seating has the amphitheatral arrangement, the floor pitching radially to the platform. The roof is open-timber construction, carried on four stone clustered columns. The walls will be tinted sand finish, and wainscotted in cherry. The organ and choir are in a recessed gallery over the platform. The floors of vestibules are to be tiled; ceilings panelled in wood. The building is to be thoroughly ventilated and heated by steam, indirect radiation. Work was begun last August, and the building will be completed in the summer of 1887. The cost will be $40,000.

HOUSE, RICHMOND, VA. MR. M. J. DIMMOCK, ARCHITECT, RICHMOND, VA.

The house to be erected on Franklin Street. The lot is an interior one, and thirty feet front. Material, rock-face red sandstone for first story, and red brick above, with a blue slate roof; the interior finished in oak, walnut and native pine.

OLD COLONIAL WORK — DETAILS FROM KING'S CHAPEL, BOSTON, MASS. MEASURED AND DRAWN BY MR. F. E. WALLIS, BOSTON, MASS.

HOUSE AT FOX HILL, NEAR PHILADELPHIA, PA. MR. T. P. CHANDLER, JR., ARCHITECT, PHILADELPHIA, PA.

DESIGN FOR A COUNTRY HOUSE. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

DOORWAY AT CHARLIEU, FRANCE.

UNITED STATES GOVERNMENT BUILDING PRACTICE. — II.[1]

GENERAL CONDITIONS AND INSTRUCTIONS.

PROPOSALS must be made in a lump sum for furnishing all the labor and materials [here are enumerated the various items of work, and for what building] in accordance with the drawings and specifications.

Bids received after the time of opening will not be considered.

Parties obtaining the drawings must return them within [blank] days from the date of receipt. [When the copies of the drawings are limited the above clause is put in allowing as many days as are necessary for bidders to prepare their estimates, otherwise it is omitted.]

Samples and Time to complete.— Each bidder must submit, with his proposal, properly-marked samples of the materials which he proposes to use in performing the work; and must also state in his bid the time in which he proposes to complete the work. The quality of the materials and the time required will be considered in awarding the contract.

Payments.— Payments will be made monthly, deducting ten per cent of the value of the work executed, and retaining same until the completion and acceptance of the entire contract.

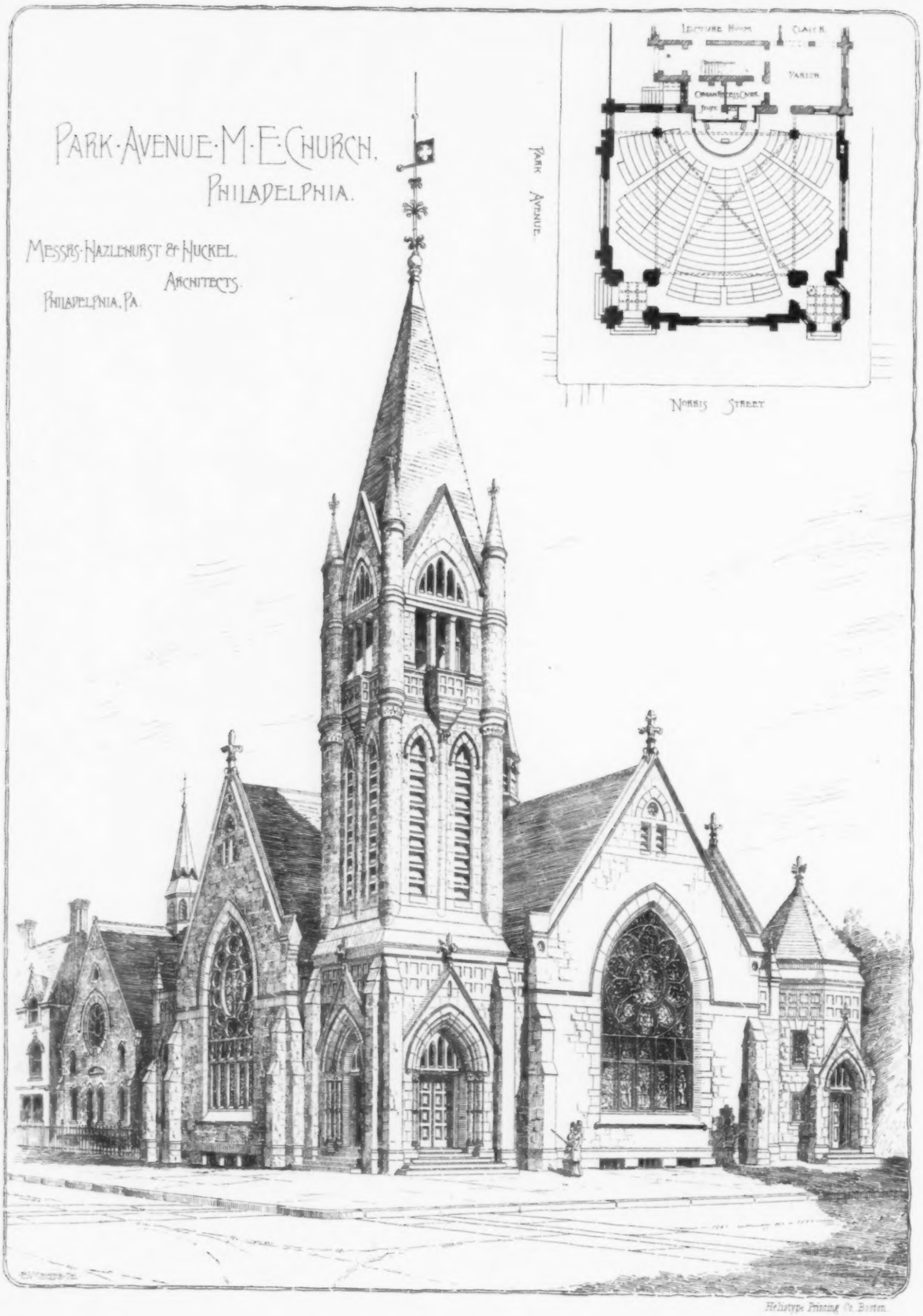
Certified Check. — All bids should be made on the blank form hereto attached, designed for the purpose, and to be obtained on application at this office or the office of the Superintendent of Construction, and must be accompanied by a certified check for the sum of $—— [the amount of the check varies, and is intended to reimburse the Government for any damage, in case the lowest bidder or contractor declines to perform the work], drawn to the order of the Treasurer of the United States, as security that the bidder will accept and perform the contract if awarded him, and (in case the United States shall so desire) will execute within two weeks from date of receipt of form a contract for said work, and give such bond for the faithful performance thereof as shall be satisfactory to the United States; the sufficiency of the sureties on such contract to be certified by the judge or clerk of the United States District Court, or the United States District Attorney for the district in which the bidder resides.

[1] Continued from page 67, No. 580.

COPYRIGHT, 1887, BY TICKNOR & CO.

Park Avenue M. E. Church, Philadelphia.

Messrs. Hazlehurst & Huckel, Architects, Philadelphia, Pa.



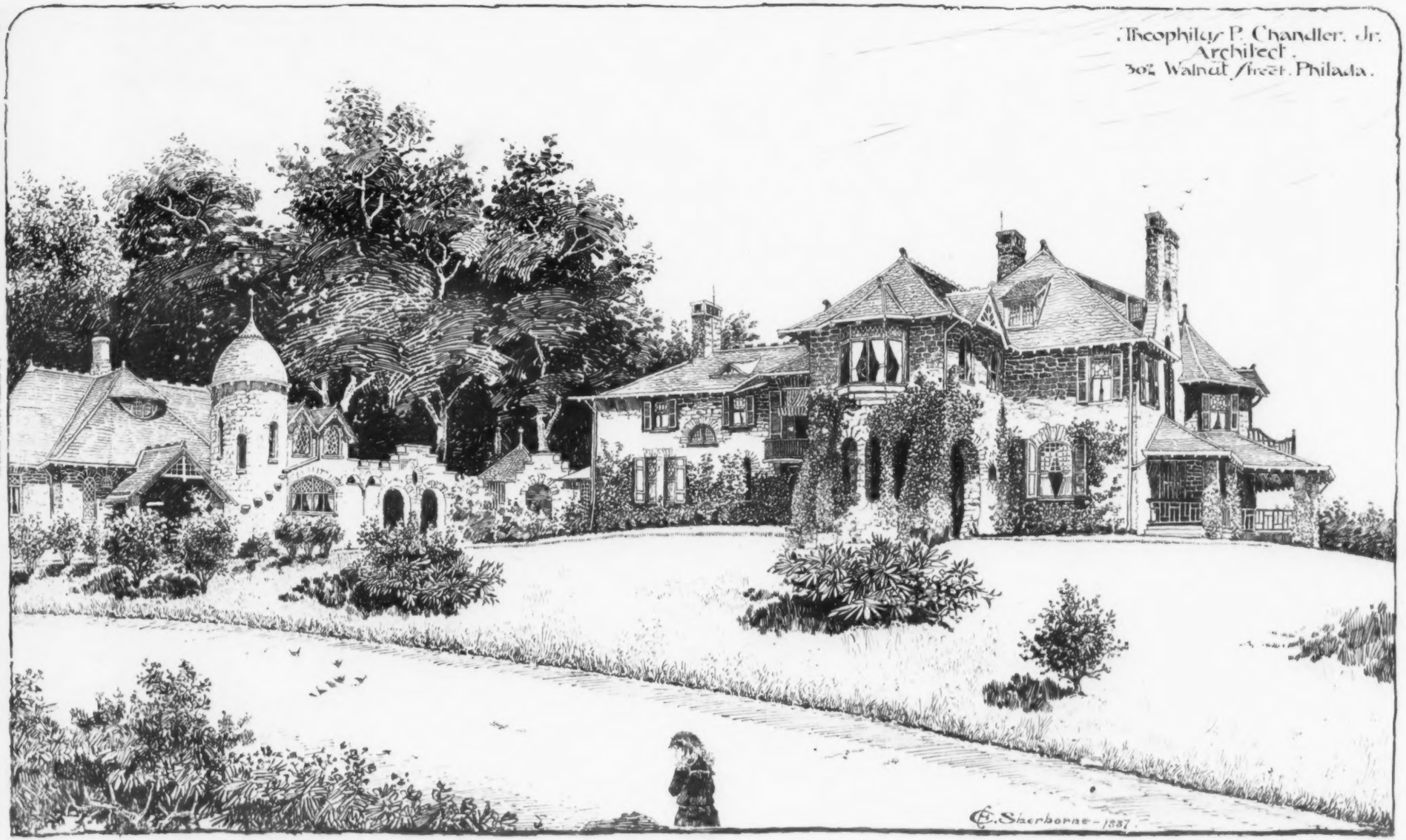
Heliotype Printing Co. Boston.

COPYRIGHT 1887 BY TICKNOR & CO.

Heliotype Printing Co. Boston

Doorway at Charlieu, France.

No. 554 AMERICAN ARCHITECT AND BUILDING NEWS, MAR. 5, 1887.



CABIN WITH LARGE HALL, BILLIARD AND SMOKING ROOMS AND RESIDENCE.

AT FOX HILL · NEAR · PHILADELPHIA, PA.

Heliotype Printing Co. Boston.

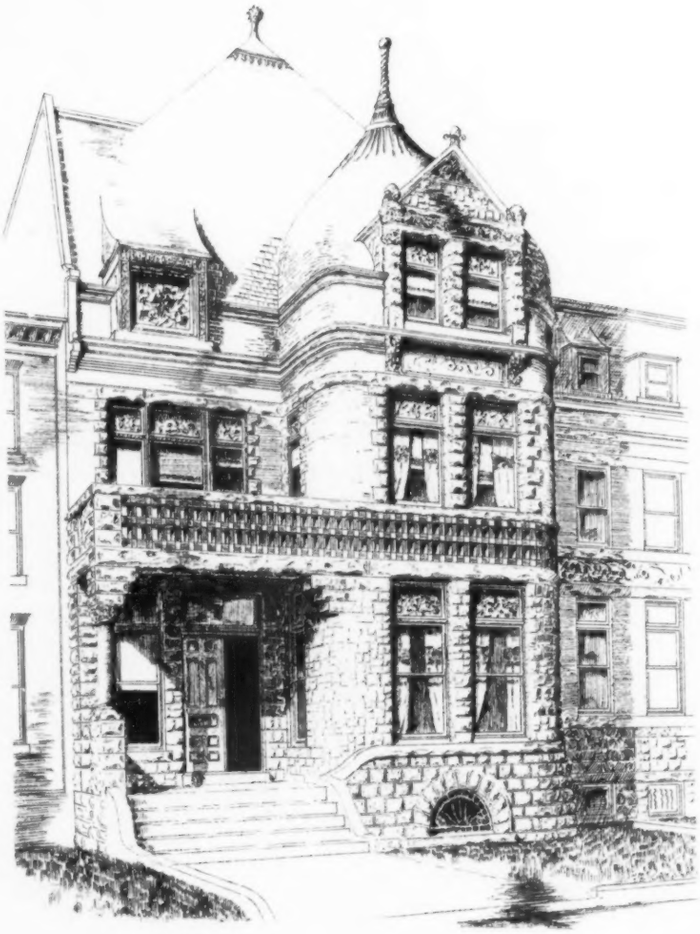
COPYRIGHT 1887 BY TICKNOR & CO.

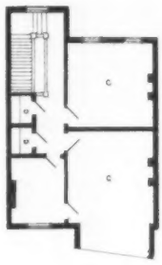
Sketch. Country House.
Charles Edwards, Architect.
Paterson, N.J.

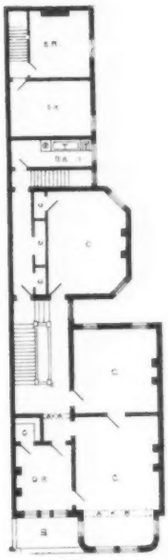
COPYRIGHT 1887 BY TICKNOR & CO.

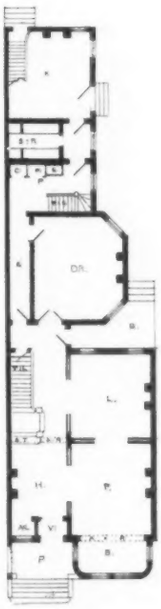
Design for Residence, Richmond, Va.

Richmond
VA.









Heliotype Printing Co. Boston.

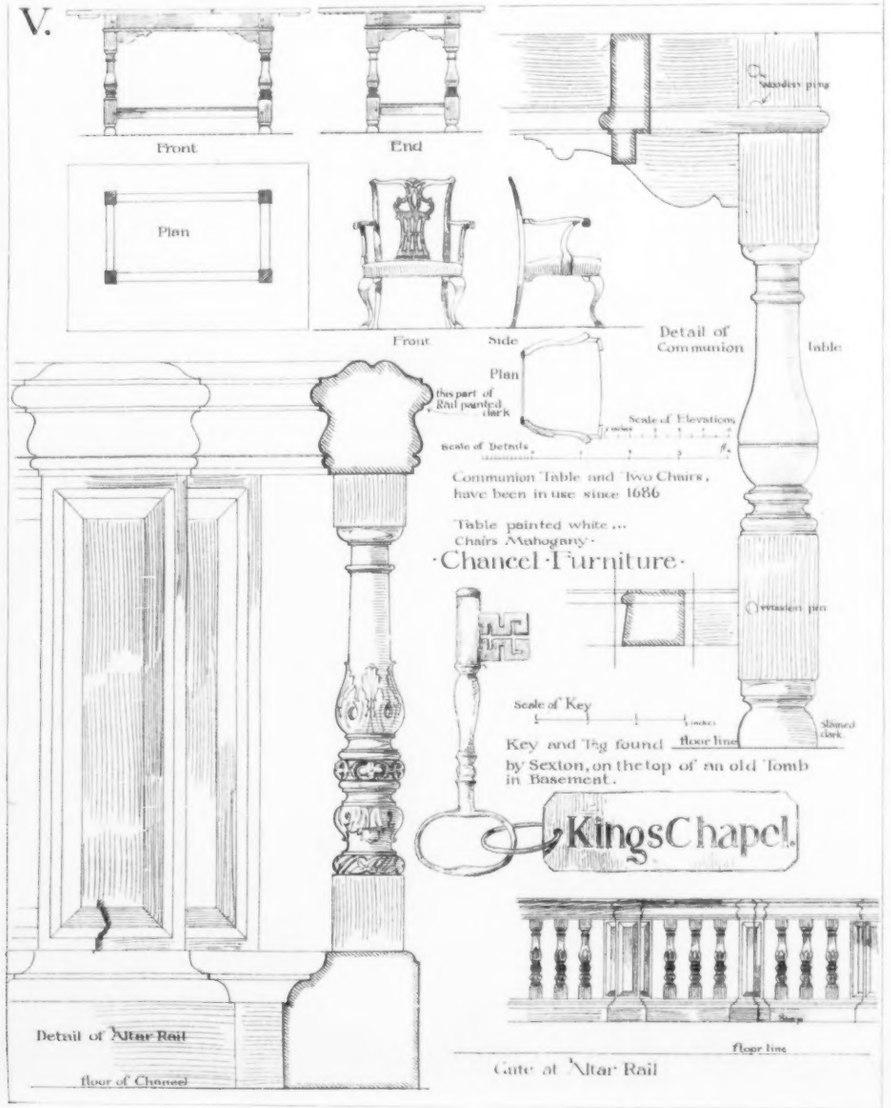
Heliotype Printing Co. Boston.

American Architect and Building News, Mar. 5, 1887. No. 554.

COPYRIGHT 1887 BY WILLIAL & CO

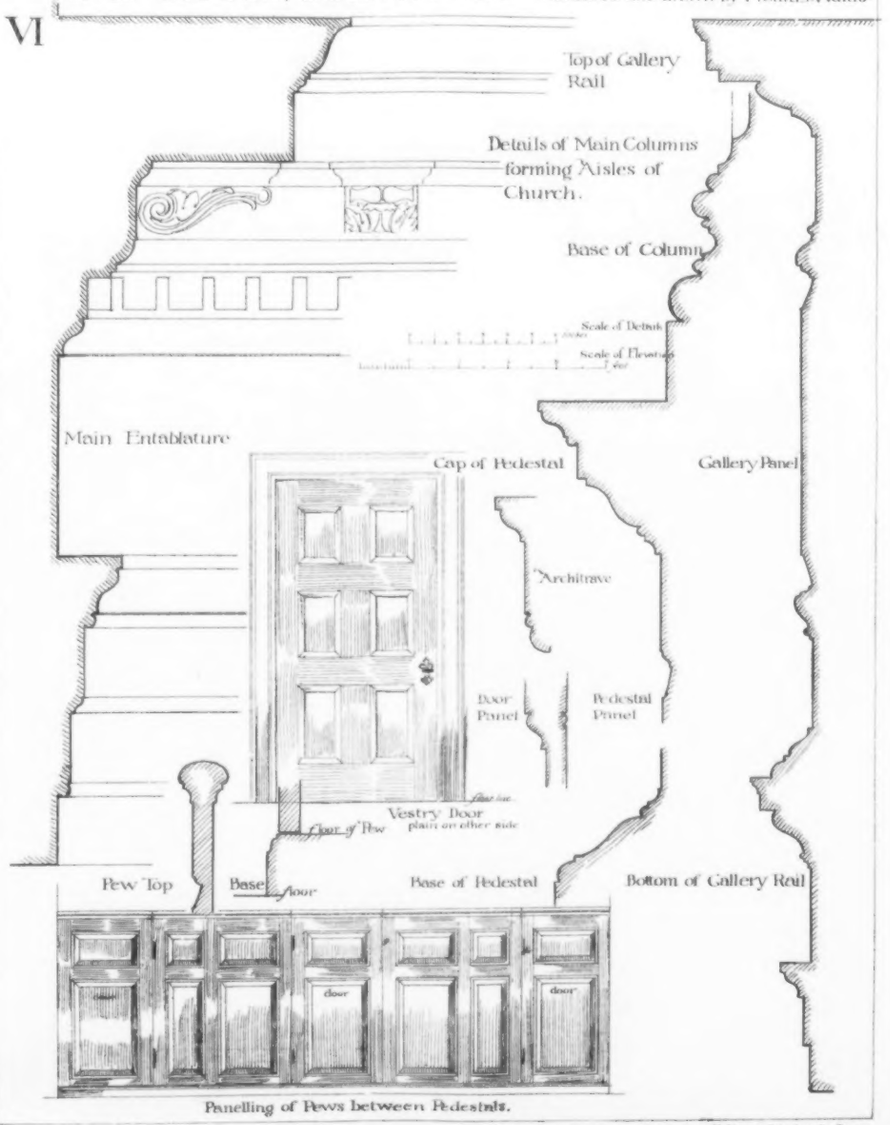
V.

KINGS CHAPEL, BOSTON MASS. Measured and Drawn by Frank E. Wallis.



VI

KINGS CHAPEL, BOSTON MASS. Measured and drawn by Frank E. Wallis.



Panelling of Pews between Pedestals.

Heliotype Printing Co. Boston.

Return of Checks. — The checks of the unsuccessful bidders will be returned on the award of the contract; that of the successful bidder upon the receipt of the formal contract, properly executed in accordance with these requirements, or upon the satisfactory completion of the work, in case a formal contract shall not have been required, in default of which both check and contract may be forfeited at the discretion of the Secretary of the Treasury.

Members of Firm. — The individual names of a firm submitting a bid must be written out in full in the proposal.

Rights Reserved. — The rights to reject any or all bids, or to waive defects if it be deemed in the interest of the Government to do so, is reserved.

References. — The bids should conform in every respect to these requirements, and will be considered only when received from parties practically engaged in this class of work, who can refer to work of this character satisfactorily performed by them.

Each bidder is requested to examine the site or building so that he may intelligently prepare his bid.

Sub-letting. — The contractor will not be permitted to sub-let any portion of this work without the consent of this office; and whenever such sub-letting is permitted, the party performing the work will be considered the agent of the contractor, and the contractor will be held responsible for any indebtedness incurred by the said agent on account of the work.

The Department reserves the right to retain a sufficient sum, in excess of the ten per cent reserve, to meet any liabilities incurred by the contractor on account of sub-contract, until satisfied that settlement has been made.

Generally. — The contractor must provide all suitable scaffolding, tools, implements and machinery necessary for the proper execution of the work, and employ a sufficient number of workmen to insure the completion of the entire work herein specified, in a proper manner and within the time-limit stated in his bid.

Should any materials of inferior quality be found on the premises, or any incompetent workmen be employed, the contractor, upon receiving orders from the superintendent, the Supervising Architect, or his agent, shall remove such defective material, or discharge such incompetent workmen.

The plans and specifications are intended and accepted as correlative. Any work shown or noted on the plans, but not mentioned herein (or *vice versa*), shall be executed and supplied by the contractor the same as though specially mentioned by both the plans and specification. The plans and specification are intended to include the full and satisfactory completion by the contractor of the work therein provided for, notwithstanding any errors or omissions in one or the other.

The contractor shall not execute any work not originally included in the contract without a written order from the supervising architect, nor without a written agreement as to the kind and quality of the work, and the charges to be allowed therefor.

The general dimensions are shown and figured on the several plans and detailed drawings; the figured dimensions invariably to have the preference over scale dimensions.

As slight variations may have occurred in the construction of the building, the contractor must make his measurements from the actual work, and will be held responsible for the proper fitting, etc., of his work.

Endorsement. — Proposals must be enclosed in sealed envelopes, endorsed: "Proposals for [here is inserted the kind of work and for what building], and addressed to the Supervising Architect.

Damage. — The contractor will be held responsible for and be required to make good at his own expense any and all damage to completed or other work, and must clean up and remove all rubbish which may be made or caused by his workmen.

Quality of Work. — The entire work to be of the best character, executed by skilled workmen and completed to the entire satisfaction of the superintendent and Supervising Architect.

Decisions Final. — The decisions of the Supervising Architect upon plans, specification, sizes, material, or workmanship to be final and binding.

Alterations. — The Supervising Architect reserves the right to make any alterations in or additions to the work to be executed, that may be decided advisable, without in any manner whatever affecting the validity of the contract; the value of such changes to be deducted from or added to the original amount to be paid under this contract at market rates. The contractor, however, will not be allowed any additional compensation for labor or material in the execution of his contract, unless he shall have received written authority from this office and the price shall have been agreed upon, before the execution of the work.

Communications. — All communications from the contractor in regard to the work must be forwarded to the department through the office of the Superintendent of Construction.

JAMES E. BLACKWELL.

[To be continued.]

SAFE BUILDING.—XIII.[1]

CELLAR AND RETAINING WALLS.

ANALYTICAL SOLUTION.

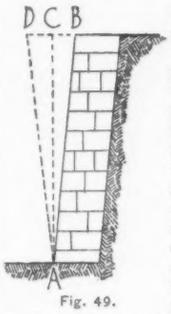


Fig. 49.

THE architect is sometimes called upon to build retaining-walls in connection with terraces, ornamental bridges, city reservoirs, or similar problems. Then, too, all cellar walls, where not adjoining other buildings, become retaining walls; hence the necessity to know how to ascertain their strength. Some writers distinguish between "face-walls" and "retaining-walls"; a face-wall being built in front of and against ground which has not been disturbed and is not likely to slide; a retaining-wall being a wall that has a filled-in backing. On this theory a face-wall would have a purely ornamental duty, and would receive no thrust, care being taken during excavation and building-operations not to allow damp or frost to get into the ground so as to prevent its rotting or losing its natural tenacity, and to drain off all surface or underground water. It seems to the writer, however, that the only walls that can *safely* be considered as "face-walls" are those built against rock, and that all walls built against other banks should be calculated as retaining-walls.

Most Economical Section. The cross-section of retaining-walls vary, according to circumstances, but the outside surface of wall is generally built with a "batter" (slope) *towards* the earth. The most economical wall is one where both the outside and back surfaces batter *towards* the earth. As one or both surfaces become nearly vertical the wall requires more material to do the same work, and the most extravagant design of all is where the back face batters away from the earth; of course, the outside exposed surface of wall must either batter towards the earth (A B in Figure 49) or be vertical, (A C); it cannot batter away from the ground, otherwise the wall would overhang (as shown at A D). Where the courses of masonry are built at right angles to the outside surface the wall will be stronger than where they are all horizontal.

Thus, for the same amount of material in a wall, and same height, Figure 50 will do the most work, or be the strongest retaining-wall, Figure 51 the next strongest, Figure 52 the next, Figure 53 next,

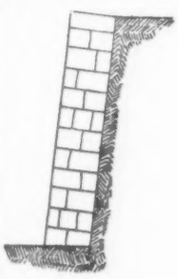


Fig. 50.

Fig. 51.

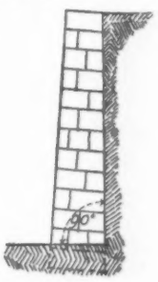


Fig. 52.

Figure 54 next, and Figure 55 the weakest. In Figure 50 and Figure 52 the joints are at right angles to the outside surface; in the

[1] Continued from page 70, number 580.

GLOSSARY OF SYMBOLS. — The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
= *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{D}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{II}, a_{III}, a_{IIII}, etc., or b, b_{II}, b_{III}, b_{IIII}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance: —

m = moment or bending moment at *centre*.
m_A = " " " *point A*.
m_B = " " " *point B*.
m_X = " " " *point X*.
s = strain at *centre*.
s_B = " *point B*.
s_X = " *point X*.
v = stress at *centre*.
v_D = " *point D*.
v_X = " *point X*.
w = load at *centre*.
w_A = " *point A*.

other figures they are all horizontal. For reservoirs, however, the shapes of Figures 54 or 55 are often employed.

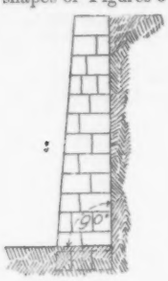


Fig. 53.

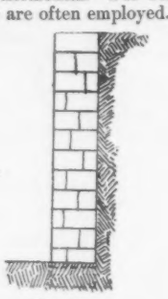


Fig. 54.

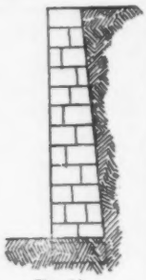


Fig. 55.

To calculate the resistance of a retaining-wall proceed as follows:

Height of Line of Pressure. The central line or axis of the pressure O P or p of backing will be at one-third of the height of back surface, measured from the ground line[1], that is at O in Figure 56, where A O $= \frac{1}{3}$. A B.

The direction of the pressure-line (except for reservoirs) is usually assumed to form an angle of 57° with the back surface of wall, or

$\angle$ P O B = 57°.

For water it is assumed normal, that is, at right angles to the back surface of wall.

If it is desired, however, to be very exact, erect O E perpendicular to back surface, and make angle E O P, or ($\angle$ x) = the angle of friction of the filling-in or backing. This angle can be found from Table X.

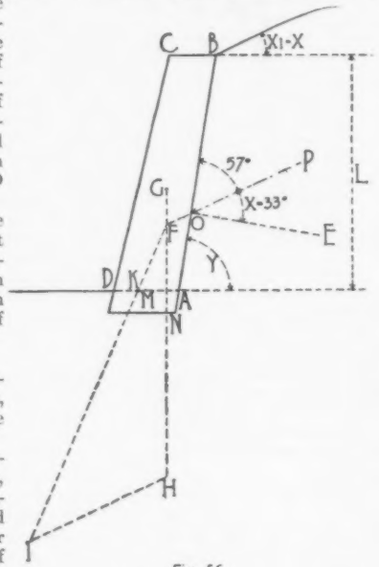


Fig. 56.

TABLE X.[2]

Material.	Weight per cubic foot. w.	Angle of friction. x.
Average (except water)	120	33°
Very compact earth	115	55°
Dry clay	100	45°
Sharp pebbles	110	45°
Dry loam	100	40°
Sharp broken stones	100	38°
Dry rammed earth	110	37°
Dry sand	112	32°
Dry gravel	110	32°
Wet rammed earth	125	27°
Wet sand	125	24°
Wet gravel	125	24°
Round pebbles	110	23°
Wet loam	130	17°
Wet clay	125	17°
Salt water	64	0°
Rain water	62½	0°

Amount of pressure—General case. The amount (p) of the pressure P O is found from the following formulæ:

If the backing is filled in higher that the wall,[3]

Backing higher than Wall.
$$p = \frac{w.L^2}{2} \cdot \frac{\sin^2.(y-x)}{\sin^2.y.\sin.(y+x)} \qquad (47)$$

If the backing is filled in only to the top level of wall,

Backing level with Wall.
$$p = \frac{w.L^2}{2} \cdot \frac{\sin.x}{\sin(y+2x)} \cdot \left(\sqrt{\cot.x - \cot(y+2x)} - \sqrt{\cot.y - \cot(y+2x)}\right) \qquad (48)$$

Where p = the total amount of pressure, in pounds, per each running foot in length of wall.

Where w = the weight, in pounds, per cubic foot of backing.

Where L = the height of retaining wall above ground, in feet. See foot note to Figure 56.

[1] Where the earth in front of the outside surface of wall C D is not packed very solidly below the grade line and against the wall, the total height of wall N B (including part underground) should be taken, in place of A B (the height above grade line).

[2] Above table of friction angles is taken from Klasen's "*Hochbau und Brückenbau — Constructionen.*" As a rule it will do to assume the angle of friction at 33° and the weight of backing at 120 lbs. per cubic foot, except in the case of water.

[3] The top slope of backing in this case should never form an angle with the horizon, greater than the friction angle.

Where y = the angle formed by the back surface of wall with the horizon.

Where x = the angle of friction of the backing as per Table X.

Even those who do not understand trigonometry can use the above formulæ.

It will simply be necessary to add or subtract, etc., the numbers of degrees of the angles y and x, and then find from any table of *natural* sines, cosines, etc., the corresponding value for the amount of the new angle. The value, so found, can then be squared, multiplied, square root extracted, etc., same as any other arithmetical problem. Should the number of degrees of the new angle be more than 90°, subtract 90° from the angle and use the positive cosine of the *difference* in place of the sine of whole, or the tangent of the *difference* in place of the co-tangent of the whole; in the latter case the value of the tangent will be a negative one, and should have the negative sign prefixed.

Thus, if $x = 33°$ and $y = 50°$, formula (47) would become:

$$p = \frac{w.L^2}{2} \cdot \frac{\sin.^2(17)°}{\sin.^2 50.° \sin. 88°}$$

The values of which, found in a table of natural sines, etc., is:

$$p = \frac{w.L^2}{2} \cdot \frac{0{,}2924^2}{0{,}766^2.\ 0{,}9994}$$

$$= \frac{w.L^2}{2} \cdot 0{,}1458 \quad = 0{,}729.\, w.L^2$$

Similarly, in formula (48), we should have for the quantity:

$$\sqrt{\cot.x - \cot.(y+2x)} = \sqrt{\cot.33° - \cot.116°}$$
$$= \sqrt{\cot.33° - [-\text{tg.}(116° - 90°)]}$$
$$= \sqrt{\cot.33° + \text{tg.}\,26°}$$
$$= \sqrt{1{,}5399 + 0{,}4877}$$
$$= \sqrt{2{,}0276} \quad = 1{,}424$$

Average Case. As already mentioned, however, the angle of friction — (except for water when it is = 0°, that is, normal to the back surface of wall) — is usually assumed at 33°; this would reduce above formulæ to a very much more convenient form, viz.:

For the average angle of friction (33°)

If the backing is higher than the wall:

Backing higher than Wall.
$$p = \frac{w.L^2}{2} \cdot \frac{(10 - n.\,0{,}55)^2.\ \sqrt{144 + n^2}}{(10 + n.\,0{,}55).\ 144} \qquad (49)$$

Or, if the backing is level with top of wall:

Backing level with Wall.
$$p = \frac{w.L^2}{2} \cdot \frac{\sqrt{144 + n^2}}{9 + n.1{,}7} \cdot \left(\sqrt{1{,}54 - \frac{n.\,0{,}4 - 11}{5 + n.\,0{,}9}} - \sqrt{\frac{n}{12} - \frac{n.\,0{,}4 - 11}{5 + n.\,0{,}9}}\right)^2 \qquad (50)$$

Where p, w and L same as for formulæ (47) and (48).

Where n = amount of slope or batter in inches (per foot height of wall) of rear surface of wall.

Thus, if the rear surface sloped *towards* the backing three inches (for each foot in height) we should have a positive quantity, or

$n = +3$.

If the rear surface sloped *away* from the backing three inches (per foot of height), n would become negative, or

$n = -3$.

When the rear surface of wall is vertical, there would be no slope, and we would have

Cellar Walls. $n = 0$.

The latter is the case generally for all cellar walls, which would still further simplify the formula, or, for *cellar walls* where weight of soil or backing varies materially from 120 pounds per cubic foot.

Cellar Walls—General case.
$$p = w.\,L^2.\ 0{,}138. \qquad (51)$$

For *cellar walls*, where the weight of soil or backing can be safely assumed to weigh 120 pounds per cubic foot

Cellar Walls—usual Case.
$$p = 16\tfrac{2}{3}.\ L^2. \qquad (52)$$

Where p = the total amount of pressure, in pounds, per each running foot in length of wall.

Where w = the weight, in pounds, per cubic foot of backing.

Where L = the height, in feet, of ground line above cellar bottom.

For different slopes of the back surface of retaining walls (assuming friction angle at 33°) we should have the following table; + denoting slope *towards* backing, − denoting slope *away* from backing.

TABLE XI.

Slope of back surface of wall in inches per foot of height.	Value of p for backings of different weights per cubic foot.	Value of p for the average backing, assumed to weigh 120 lbs. per cubic foot.
+4″	p=0,072. $w.\,L^2$	$p = 8\frac{2}{3}.\ L^2$
+3″	p=0,088. $w.\,L^2$	p=11 . L^2
+2″	p=0,098. $w.\,L^2$	p=12 . L^2
+1″	p=0,112. $w.\,L^2$	$p = 13\frac{1}{3}.\ L^2$
0″	p=0,138. $w.\,L^2$	$p = 16\frac{2}{3}.\ L^2$
−1″	p=0,157. $w.\,L^2$	p=19 . L^2
−2″	p=0,185. $w.\,L^2$	$p = 22\frac{1}{2}.\ L^2$
−3″	p=0,205. $w.\,L^2$	$p = 24\frac{2}{3}.\ L^2$
−4″	p=0,258. $w.\,L^2$	p=31 . L^2

Now having found the amount of pressure p from the most convenient formula, or from Table XI, and referring back to Figure 56, proceed as follows:

To find Curve of Pressure. Find the centre of gravity G of the mass A B C D,[1] from G draw the vertical axis G H, continue P O till it intersects G H at F. Make F H equal to the weight in pounds of the mass A B C D, (one foot thick), at any convenient scale, and at same scale make H I = p and parallel to P O, then draw I F and it is the resultant of the pressure of the earth, and the resistance of the retaining wall. Its point of intersection K with the base D A is a point of the curve of pressure.

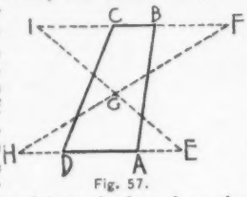


Fig. 57.

Amount of Stress at Joint. To find the exact amount of pressure on the joint D A use formula (44) for the edge of joint nearest to the point K or edge D, and formula (45) for the edge of joint farthest from the point K, or edge A.

Formula (44) was

$$v = \frac{p}{a} + 6.\frac{x.p}{a.d}$$

If M be the centre of D A, that is D M = M A = ½. D A, and remembering that the piece of wall we are calculating, is only one running foot (or one foot think), we should have

For x = K M; expressed in inches.

For a = A D. 12; (A D expressed in inches).

For d = A D; in inches, and

For p = F I, in lbs., measured at same scale as F H and H I; or, the stress at D, (the nearer edge of joint) would be v, in pounds, per square inch,

$$v = \frac{\text{F I}}{\text{A D. 12}} + 6.\frac{\text{KM.FI}}{\text{12. AD}^2}$$

Remembering to measure all parts in inches *except* F I, which must be measured at same scale as was used to lay out F H and H I. Similarly we should obtain the stress at A in pounds per square inch.

$$v = \frac{\text{F I}}{\text{AD. 12}} - 6.\frac{\text{KM.FI}}{\text{12.AD}^2}$$

v should not exceed the safe crushing strength of the material if positive; or if v is negative, the safe tensile strength of the mortar. If we find the wall too weak, we must enlarge A D, or if too strong, we can diminish it; in either case, finding the new centre of gravity G of the new mass A B C D and repeating the operation from that point; the pressure of course remaining the same so long as the slope of back surface remains unaltered. If the wall is a very high one, it should be divided into several sections in height, and each section examined separately, the base of each section being treated the same as if it were the joint at the ground line, and the *whole* mass of wall *in* the section and *above* the section being taken in each time.

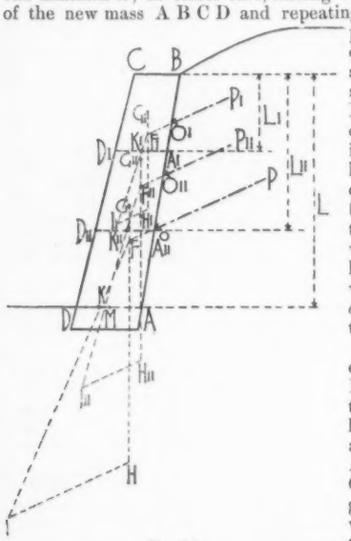


Fig. 58

Thus in Figure 58, when examining the part A_1 B C D_1, we should find O_1 P_1, for the part only, using L_1 as its height, the point O_1 being at one third the height of A_1 B or A_1 $O_1 = \frac{1}{3}$. A_1 B; G_1 would be the centre of gravity of A_1 B C D_1, while F_1 H_1 would be equal to the weight of its mass, one foot thick; this gives one point of the curve of pressure at K_1, with the amount of pressure = F_1 I_1, so that we can examine the pressures on the fibres at D_1 and A_1. Similarly when comparing the section A_{11} B C D_{11} we have the height L_{11}, and so find the amount of pressure O_{11} P_{11}, applied at O_{11}, where A_{11} $O_{11} = \frac{1}{3}$ A_{11} B; G_{11} is centre of gravity of A_{11} B C D_{11}, while F_{11} H_{11} is equal to the weight of A_{11} B C D_{11}, one foot thick, and F_{11} I_{11} gives us the amount of pressure on the joint, and another point K_{11} of curve of pressure, so that we can examine the stress on the fibres at D_{11} and A_{11}. For the whole mass A B C D we, of course, proceed as before.

Reservoir Walls. For reservoirs the line of pressure O P is always at right angles to the back surface of the wall, so that we can simplify formula (50) and use for rain water:

$$p = 31\tfrac{1}{4}.\ \text{L}^2 \qquad (53)$$

For salt water:

$$p = 32.\ \text{L}^2 \qquad (54)$$

Where p = the amount of pressure, in pounds, on one running foot in length of wall, and at one-third the height of water, measured from the bottom, and p taken normal to back surface of wall,

Where L = the depth of water in feet.

[1] To find the centre of gravity of a trapezoid A B C D, Fig. 57, prolong C B until B F = C I = D A and prolong D A until A E = D H = C B, draw E I and H F and their point of intersection G is the centre of gravity of the whole.

If Backing is Loaded. Where there is a superimposed weight on the backing of a retaining-wall proceed as follows:

In Figure 59 draw the angle C A D = x, the angle of friction of the material. Then take the amount of load, in pounds, coming on B C and one running foot of it in thickness (at right angles to B C), divide this by the area, in feet, of the triangle A B C and add the quotient to w, the weight of the backing per cubic foot, then proceed as before, inserting the sum w_1 in place of w in formulæ (47) to (51) and in Table XI, when calculating p; or $w_1 = w + \frac{2.z}{\text{B.L}}$ (55)

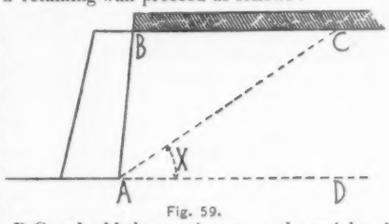


Fig. 59.

Where w_1 = the amount, in pounds, to be used in all the formulæ (47) to (51) and in Table XI, in place of w.

Where w = weight of soil or backing, in pounds, per cubic foot.

Where z = the superimposed load on backing, in pounds, per running foot in length of wall.

Where B = length, in feet, of B C, as found in Figure 59.

Where L = the height of wall, in feet.

Where there is a superimposed load on the backing, the central line of pressure p should be assumed as striking the back surface of wall higher than one-third its length, the point selected, being at a height X from base; where X is found as per formula (56)

$$\text{X} = \frac{\text{L.}\ (w_1 - \frac{2}{3}\ w)}{2w_1 - w} \qquad (56)$$

Where X = the height, in feet, from base, at which pressure is applied, when there is a superimposed load on the backing.

Where L = the height, in feet, of wall.

Where w = the weight, in pounds, per cubic foot of backing.

Where w_1 = is found from formula (55)

When calculating the pressure against cellar walls, only the actual weight of the material of walls, floors and roof should be assumed as coming on the wall, and no addition should be made for wind or load on floors, as these cannot always be relied on to be on hand. The additional compression due to them should, however, be added afterwards.[2]

LOUIS DECOPPET BERG.

[To be continued.]

THE USE OF MORTAR DURING FROST.

SOME time ago the police authorities of Berlin issued an order forbidding the construction of brickwork, should the temperature fall to or below 2° R. (26° Fahr.). This order being based on the supposition that mortar freezes at that temperature, and does not set, Herr Krause, architect, of Stropp, sent a communicatiou to the *Baugewerke-Zeitung*, in which he publishes his experiences, which by no means seem to bear out the necessity for issuing the order. We give a *résumé* of Herr Krause's remarks, as well as of the opinions of some other German architects upon the matter. Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very heavy sharp frost, the temperature being down to from 4° to 8° R. (23° to 14° Fahr.). As bricks and sand were frozen, his workmen had great trouble in properly setting the bricks, the mortar freezing under their hands. It would have been too expensive to warm all the materials previously. He, therefore, had the lime slaked in small quantities, mixed the mortar hot, and had the brickwork liberally pointed. He fully expected to find the mortar perished in the spring; but he was greatly mistaken, for the work was as firm as if it had stood for several years. In 1880 he had to take the same building down, when the mortar was found so firm that the bricks broke and could be cleaned only with difficulty. Herr Krause subsequently had other pointing done at several degrees of frost, and always found that, if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. The architect in question says that, if it freezes, and the frost continues for some time, it is much firmer than when applied in the height of the summer. It is different when a sudden thaw sets in after a sharp frost.

Herr Krause had executed, during an alteration, a wall ten metres high and three metres wide, with three windows placed over each other, and joined to an old brick wall, when suddenly a thaw set in. The wall settled about six centimetres, and bulged out, so that he had great trouble in preventing it from collapsing. A sudden frost, however, made it firm again. After twenty years the wall is as good as ever, and there are no cracks. In that case, however, he had omitted to use unslaked lime, employing only hot water. The bricks had been stored in a heated room. Herr Krause has come to the conclusion that continued frost had the contrary effect upon mortar to what is generally supposed.

Herr A. Klemm, architect, of Stuttgart, expresses the same opinion

[2] Where a wall is not to be kept braced until the superimposed wall, etc., is on it, these should of course be entirely omitted from the calculation, and the wall must be made heavy enough to stand alone.

in a communication which he sends to the *Deutsche Bauzeitung*, in which he says that in the winter of 1848–49 the works required for altering and fitting up the Prussian House of Deputies had to be carried out during a most severe frost. Notwithstanding this fact, the brickwork, executed with freshly-slaked hydraulic lime, was found to be so firm in 1867, when alterations had to be made, that in some portions wedges had to be used in breaking it up. Herr Klemm adds that in his country (Würtemberg) it is the general opinion that frost not only does not injure the brickwork, nor the plastering, but it improves its quality. The frost, however, should continue for some time. Herr Klemm expresses surprise that doubts could be entertained on the subject. A Berlin firm of builders, Herren Ende & Böckmann, writing on the same subject to the *Deutsche Bauzeitung*, state that, in the autumn of 1864, they had orders to erect a warehouse, near Unter den Linden, during the winter. They were at first indisposed to undertake such work in that season; but circumstances demanded speed, and building-operations were continued during the frost. They fully expected to find the brickwork faulty in places when the spring came, and had made up their minds that they would have to replace some of it. They were agreeably surprised to find the brickwork perfectly sound; in fact, it seemed to have set exceptionally well. Since that time the above Berlin firm of builders have not hesitated to continue bricklayers' work as long as they could; that is to say, as long as the water did not freeze on the bricks or the mortar in the pans. It should be added that the lime mortar used at Berlin is said to be of exceptionally good quality. — *The Builder.*

COMMUNICATIONS

"SAFE BUILDING." — CORRECTIONS.

Chicago, February 8, 1887.

To the Editors of the American Architect: —

Dear Sirs, — In carefully studying "Safe Building" — at top of page 68, February 5, 1887, I find Mr. Berg has made a slight mistake by introducing the decimal point, hence marring the perfection of his able paper. The load on the 12-inch pier being 25,000 pounds distributed over an area of 144 square inches, the pressure per square inch under pier would be $\frac{25000}{144} = 174$ pounds, instead of 17.4 pounds; and the foundation of pier (instead of gable wall), must be made wider, in order to avoid unequal settlement. As the main wall has a load of 30 pounds per square inch on footings, we have, required width of footing under pier $= \sqrt{\frac{25000}{30}} = 29''$ square; 25,000 pounds is not a safe load for a 12″ pier.

Yours respectfully, F. L. Lively.

[The presence of the decimal point was due, not to Mr. Berg, but to the printer, for whom we have made apologies before. — Eds. American Architect.]

THE WEIGHT OF STORED MERCHANDISE. — FLAT ROOFS.

Boston, Mass., February 28, 1887.

To the Editors of the American Architect: —

Dear Sirs, — In answer to Mr. Kidder's inquiry as to the weight of various materials per square foot of floor, I beg to refer him to the tables which are given on pages 118, 119 and 120 in "*The Fire Protection of Mills*," by C. J. H. Woodbury, published by John Wiley & Sons, 15 Astor Place, New York, from which table I made only a few selections to illustrate the communications which I made to you.

Having begun a letter to you permit me now to recur to another subject, to wit, *the roof question.*

The tendency of the half-educated architect to adopt the style of roof to which I once gave the name of "the crazy roof," with its many peaks, inverted pepper-boxes, valleys and other leaky places, appears to have about exhausted itself, and the best architects are coming back to simple and sensible forms and methods of constructing roofs. In some few cases owners are willing to incur the slight additional expense which is required in order to make the roofs of solid timbers set at considerable distances apart, covered with plank in place of thin boards; and in some recent cases I have even heard of the adoption in dwelling-houses of the old and well-established mill method of laying shingles over mortar on the outside of the plank for purposes of safety from fire and to prevent the passage of heat or cold through the roof.

There remains only one more point to be covered which utterly offends the present æsthetic requirements of architecture, to wit: the substitution of the flat-roof or of the roof with a pitch of half-inch to the foot, constructed like the deck of a ship.

Where utility only is considered, as in the factory, no other roof is now thought of for a moment. It has been fully proved in practice that a roof made of three-inch pine, covered with any of the ordinary compounds or with cotton duck properly prepared and properly laid, suffices to keep out the heat of the summer sun and to retain warmth in winter. It also renders even the one-story factory as well as the upper room of the high factory, the lightest and best ventilated and most suitable room for almost every kind of work.

If due attention to art and to architecture can be reconciled to the conditions of the flat-roof or roof of very slight pitch, the upper story of every house and the upper room of every city building may be made the most desirable in the building.

The question presented to the architect, who must provide for the conditions of such a climate as that of New England, is how to reconcile art, architecture and utility in a building covered by a flat roof. Is this beyond the scope or power of the artist or the architect? Edward Atkinson.

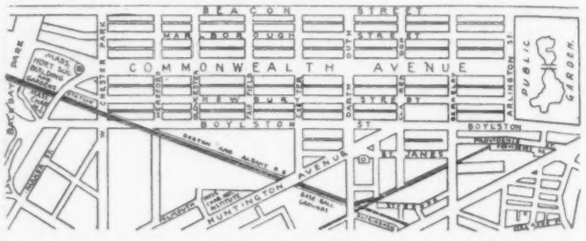
METROPOLITAN IMPROVEMENTS.

Boston, February 24.

To the Editors of the American Architect: —

Dear Sirs, — The President of the Horticultural Society says: "There is no piece of ground unoccupied now anywhere in the city, outside of the Public Garden, available for the purposes of the Society." It is not clear what Dr. Walcott means by "the city;" but within Boston's territorial limits there is a rather large acreage still unoccupied, a small portion of which might perhaps wisely be made available for gardens for this Society, such as surely it ought to have for its exhibitions — or if not solely for its own exhibitions, then jointly with another society for general and various exhibitions — like the Horticultural Gardens at South Kensington. Is not this suggestion worth thinking about, and especially if thereby our metropolis could gain largely in beauty and attractiveness?

Is it not evident that the best central line for the future rapid-transit system must be by the Albany Railway to the Providence station, and thence under the Common to Park Street, as the cheapest and most central route by which quick transit between the old city and the new and future West End can be obtained, and the one with which the greatest number of the railways can profitably connect? On this line, at the end of the original lines of Commonwealth Avenue, and between its extension, so-called, the railway and the entrance to the Back Bay "Park," so-called, is an area unoccupied, as yet, except by two houses, the greater part of which land could be used for such gardens with the greatest advantage to the beauty of the city, by preventing the building-up of the oblique line which will so abruptly close the vista of the avenue with the worst possible



effect, there being no apparent *raison d' être* for the bending of the straight lines at this point. The idea of an avenue of such proportions, character and ornamentation being laid out to lead *to nothing but an awkward bend*, must strike every stranger of refinement as a most strange defiance of the laws of taste for the Athens of America to have committed. Nothing less than a structure perfectly palatial in size and ornamentation of façade, or a real cathedral, could look at all well on this portion of the southerly side of the so-called extension of the avenue, or seem to afford a reason for the deflection of the long, straight lines.

We must jump at any possible chance, and leave no stone unturned, to endeavor now — almost hopelessly late though it certainly is — to prevent the building of any more obtrusive houses on this unfortunately designed line, and to remove those that are already built there. I beg, therefore, to ask consideration of the accompanying sketch plan. It provides a new entrance to the "Improvement" grounds, greatly to be desired for direct connection with their easterly side, while the double divergence of the roadway would leave an admirable site for a great monument to the signers of the Declaration of Independence, a Liberty column such as Boston surely ought to have. Would not the Horticultural Society and the Mechanics' Charitable Association unite in leasing and improving the remainder of this area, for exhibition gardens, if gentlemen would unite in securing it for that purpose, the Mechanics' Association purchasing the land on the other side of the railway instead of its present location, and both societies uniting in the erection of a building, the greater portion of which would occupy the ground on the southerly side of the railway, with an annex, connected by a bridge, on the northerly side, the remainder of the ground being devoted to gardens open to visitors to all exhibitions of either society? The site is remarkably well adapted for such purposes, since a railway-station, extending under the bridge of the exhibition-building, could have connection with it by a separate stairway for visitors to or from either side, while objects and material for exhibition could be received at doors in the basement of the building directly from freight cars. Moreover, the intended line of horse-cars over Boylston Street, extended, would pass the entrance of the building on that side.

The time must surely soon come when the Albany Railway can very profitably cease to run its freight trains over this portion of its track, establishing a new freight terminus in the Lowell Street vicinity, to be reached by the Grand Junction tracks, and thus obtaining the facility of running circuit trains between that point and Park Square, and opening the way to a most valuable system of rapid transit; but while no more freight-*trains* should be run over the Back Bay, if these exhibition gardens were established, one or two freight-cars might be attached to late passenger-trains, as occasion might require, to convey exhibition-freight to or from the building.

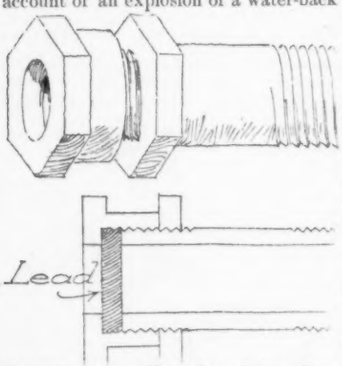
The very convenient situation of the building, and its great extent of southerly exposure, would make it greatly resorted to as a "winter garden"—a great additional attraction to Boston during eight months of the year, while during the other four, evening promenade-concerts in the open gardens, would, no doubt, attract very large audiences. So that, at least eventually, with the future increase of population of this vicinity and the suburbs, these gardens would be very profitable. But if these societies could not at first afford to pay a fair rent for this ground for these gardens, are there not a sufficient number of wealthy and public-spirited gentlemen who would willingly make the investment for low returns for some years, for the sake of saving Commonwealth Avenue from its deformity and gaining so superb a monumental site, and, at the same time, encouraging other railways to connect their tracks with those of the Albany to bring some of their trains to this point, thus paving the way for a better system of rapid transit and long-distance passenger facilities than any other city in America is likely ever to obtain, and thus greatly promoting Boston's advantages and prosperity? Are not these such metropolitan improvements as are due to Boston's reputation for enterprising works of utility and refinement? C.

SAFETY-PLUG FOR WATER-BACKS.

BOSTON, MASS., February 24, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In your issue of February 12th, your editorial account of an explosion of a water-back in London mentions a valve for preventing explosions, and states, incidentally, that you "can hardly imagine what this valve may be."



An appliance for this purpose is successfully used in Montreal. It consists of a disc of thin sheet-lead, confined by an annular cup against a flanged nipple, which is screwed into the side of the water-back. In the event of the pipes freezing, a fire being started in the range, the steam pressure generated will blow out this lead disc and relieve the apparatus. The pipes being thawed a new disc can be readily inserted. The nipple and cap are made of brass, substantially as shown in sketch annexed, and the device is patented in Canada.

Yours truly, J. M. BETTON.

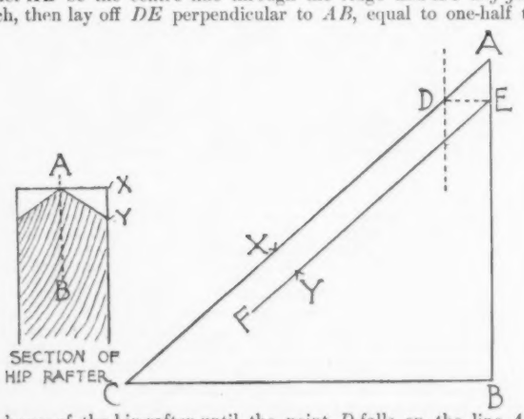
TO FIND THE BEVEL OF A HIP-RAFTER.

NEW LONDON, CONN., February 21, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In answer to the letter of "Anxious," January 22d, asking how to find the bevel of a hip-rafter: perhaps the following method is as simple as any since it requires the use of a carpenters' square only.

Let *AB* be the centre line through the ridge and *AC* *any given* pitch, then lay off *DE* perpendicular to *AB*, equal to one-half the thickness of the hip-rafter until the point *D* falls on the line *AC*; at the point *E* draw *EF* parallel to *AC*, then the perpendicular distance *XY* between *AC* and *EF* is the bevel required as shown in the section.



Yours very truly, H. G. K.

NOTES AND CLIPPINGS

THE MESQUITE TREE.—One of the leading timber resources of Texas, the mesquite tree, is described as follows: The bark is regarded as yielding more tannin than the red oak; and the wood of the larger trees, bearing a close resemblance to mahogany in color and general appearance, is largely used in cabinet-making. The bean of the tree is the delight of cattle, and, growing as it does in prolific supply in dry seasons, affords excellent food for all kinds of stock. The tree is first rate as a post timber, and, besides possessing those other qualities, it emits a gum as good, if not superior to the gum arabic, which even now is prepared and used as a mucilage by many of our business men for office purposes. Why may not such benefits be developed and become, at some future day, an article of commerce? Added to all these valuable uses of the mesquite tree, it is in many instances a graceful and ornamental shade tree for the yard.—*Timber Trades Journal.*

CHALETS DE NECESSITE, PARIS.—The Municipal Council of Paris appears to have solved the difficulty of providing public conveniences for both sexes in a satisfactory manner, and, although what has succeeded in Paris might not be successful in London on account of the differences in the habits of the inhabitants of the two capitals, the requirements of the two peoples are practically the same, and it may serve a useful purpose to put on record the manner in which this public want has been supplied in Paris. The concession to erect what the French call *châlets de nécessité* has been granted to a company for a period of thirty years, the company providing the châlets, and undertaking to keep them in repair, and paying a sum of 800*l* a year to the municipality by way of rent. At the expiration of the concession the whole of the buildings erected by the company are to become the property of the city, the fittings and furniture being taken at a valuation. The company have erected 101 *châlets*, 84 with ten compartments and 17 with four compartments. The cost of the larger of these buildings is about 560*l* each, and of the smaller type about 360*l* each, and the total capital expended is about 53,000*l*, the greater part of which will revert to the municipality at the expiration of the concession. The cost of maintenance of the buildings, irrespective of the fittings, is about 600*l* a year. The amount authorized to be charged for the use of the *châlets* varies from 2½*d* to 1½*d*, but the sums actually charged by the company do not exceed three half-pence, and in some instances are as low as one half-penny. The success of the enterprise appears to be greatly due to the low tariff of charges fixed by the company. Each *châlet* is placed in the charge of a woman, who is required to keep it in order, and is enjoined to use the greatest civility towards the public. The buildings are under the control of a superintendent, assisted by an inspector, and there are three collectors for the receipts, which are checked by a mechanical apparatus placed over the doors of the several compartments.—*The Builder.*

PARIS STATUES.—This is a question that a large section of the French Press have been lately engaged in trying to give a negative or an affirmative reply to, and not only in respect of Paris, but also of the different provincial towns. Some recently-collected statistics by M. Paul Marmottan, one of the Deputies of Paris, affords conclusive evidence that the capital at all events is not too plentifully supplied with statues, there being but thirty-four in all, including two of Napoleon, two of Voltaire, and one representing the Republic. The list, as given by M. Marmottan, is a very curious one, including, as it does, the statues of Charlemagne upon the open ground opposite Nôtre Dame; of Gutenberg, opposite the National Printing-Office; of Jeanne d'Arc, upon the Place des Pyramides; of Bernard Pallisy, upon the Place St. Germain-des-Prés; of Henry IV, upon the Pont Neuf; of Louis XIII, upon the Place des Voges; of Molière, in the Rue Richelieu; of Pascal, at the foot of the Tour St. Jacques; of Louis XIV, upon the Place des Victoires; of Voltaire, in the Square Monge and on the Quai Malaquais; of the Abbé de l'Epée, near the Deaf and Dumb Institute; of Diderot, upon the Place St. Germain-des-Prés; of Sédaine, in the Square Trudaine; of Malesherbes, at the Palais de Justice; of Haüy, at the Institute of the Blind; of Pinel, at the Saltpêtrière Hospital; of Moncey, at the Place Clichy; of Larrey, at the Val-de-Grâce Hospital; of Ney, upon the Place de l'Observatoire; of Napoleon, upon the summit of the Colonne Vendôme and in the court-yard of the Invalides; of Bichat, at the School of Medicine; of Prince Eugène, in the Gardens of the Invalides; of Béranger, in the Square du Temple; of Lamartine, in the Avenue Victor Hugo; of Berryer, at the Palais de Justice; of Berlioz, in the Square Vintimille; of Alexander Dumas, upon the Place Malesherbes; of Ledru Rollin, upon the Place bearing his name; of Claude Bernard, outside the Collége de France; of Henri Regnault, at the Ecole des Beaux Arts; of Bossuet, Fénélon, Flechier, Massillon, upon the Place St. Sulpice; and of the Republic upon what was formerly called the Place du Château d'Eau, but is now the Place de la République. The history and vicissitudes of all these statues are described in M. Marmottan's book, and the oldest is that of Henry IV, upon the Pont Neuf. It was first erected by his widow, Marie de Medicis, in 1614, and the bronze horse which the king bestrode was originally cast for Ferdinand, Duke of Tuscany, but was given at his death by Cosmo de Medici to his sister. The vessel which was bringing it from Italy to France was wrecked off the coast of Normandy, and the bronze horse remained for a year buried in the sea. After it had been erected upon the Pont Neuf, with Henry IV upon its back, it underwent no further vicissitudes until 1792, when horse and rider were melted down into cannon. A fresh statue was erected upon the model of the original one in 1818, and though the Communists threatened to destroy it in 1871 they did not do so.—*British Architect.*

Another Storage-Battery.—Since the first storage-batteries manufactured by the French electrician Faure arrived in this country on board the *Labrador*, in 1881, there has been a constant effort to introduce the storage-battery as an article of commerce in New York. For some years, in London, this has been done by the companies working under the patents of Faure, Sellon, Volckmar and others, and to-day, in London, many shops and private houses are lighted in this fashion. In New York, each company organized for the manufacture and sale of storage-batteries has become entangled in the meshes of patent litigation, and very few batteries have been manufactured. The latest company organized for the purpose of introducing the storage-battery, as a practical means of lighting buildings, is about three months' old. The new company has built works in Newark, N. J., opened offices in New York, and stands ready to sell plants to people who can be induced to believe in the durability of their apparatus. So far this question has been the stumbling-block of all attempts to bring a practical battery into every-day use. The battery would not last. For a few weeks or months it would answer its purpose fairly well, and then would come to grief. The electricians of the new company believe that their battery will last for a number of years.

The principle of the storage-battery, so far as understood, has been explained over and over again. A plate of lead immersed in acidulated water undergoes certain changes when submitted to the action of a current of electricity. When the current is stopped, it is found that the apparatus will give back a certain amount of the electricity it has received The electricity produces a certain chemical change in the lead; in reverting to its original condition this electricity is again given out. Millions of dollars have been spent in France, Germany and England, to say nothing of the United States, within the last ten years, in devising an apparatus which shall give out a high percentage of the electricity received, and which shall retain its efficiency through years. The advantage of a satisfactory storage-battery is, that while it is necessory to run dynamos at full speed in order to supply even one incandescent light, the electricity for lights fed by a storage-battery can be supplied from a dynamo at any time when waste steam-power is available. Thus, in one country-house, near Philadelphia, which is lighted by fifty sixteen-candle lamps, the battery is charged but once a week. Every Monday a small engine is run in connection with the battery all day, and that is sufficient to store up electricity enough for a week, no particular economy being observed in the use of the light. Wherever waste power exists it is, of course, evident that a durable and efficient storage-battery will be of the utmost value.—*N. Y. Evening Post.*

The Value of London Land.—It has been ascertained, with regard to the Imperial Institute, that the site of about five acres recently secured for the new Admiralty and War Offices is valued at £820,000, or rather over £160,000 per acre; that now vacant in Charles Street, opposite the India Office, is less than an acre, and would cost at least £125,000; probably another acre might be secured by private contract, so that the value of a limited site in this position would not be less than £250,000. It has been suggested that a single acre not far from Charing Cross might be obtained for £224,000. Two and a half acres on the Thames enbankment have been offered for £400,000, and it is stated that six acres may be procured from Christ's Hospital at £600,000. Another good central position has been suggested consisting of two and a half acres, which has been valued at £668,000. Even if a reduced price were accepted, no site in that direction is to be had for less than a quarter of a million. This explanation is offered for falling back on the site which belongs to the Commissioners of the Exhibition of 1851.—*The Court Journal.*

The Late Sir Joseph Whitworth.—Writing of the late Sir Joseph Whitworth, the *London News* says: Everybody now knows the Whitworth planes, the surfaces which fit so exactly that they slide over one another, as if assisted with some lubricating matter, and on the application of very slight pressure cling together with a tenacity apparently out of all proportion to the pressure of the atmosphere. While engaged in preparing his now celebrated planes he was, of course, laughed at by his fellow-workmen. The man who sat at the next bench was delighted at the joke, although he took, as a good workman always does, considerable interest in a long and, apparently, almost impossible job. Up to that time the most accurate planes had been obtained by first planing and then grinding the surfaces. They were never true. Whitworth's first step was to abandon grinding for scraping. Taking two metal surfaces as true as the planing-tool could make them, he coated one of them thinly with coloring-matter, and rubbed the other over it. Had the two surfaces been true, the coloring-matter should have spread itself uniformly over the upper one. It never did so, but appeared in spots and patches. These marked the eminences which Whitworth removed with a scraping tool till the surfaces gradually became more nearly coincident. But he reflected that the coincidence of two surfaces would not prove them to be planes. If one were concave and the other convex, they might still coincide. This difficulty he got over by taking a third surface and adjusting it to both. By a series of comparisons and adjustments he at last made all three surfaces coincide, and then knew that he had got true planes. When they were done he showed them, one Sunday morning, to his fellow-workman, who was thunderstruck, but rejoiced heartily over the good work done.

The perfect planes made Whitworth's fortune. Bringing them with him from London to Manchester, in 1833, he wrote over his door "Joseph Whitworth, tool-maker, from London." His tool-shop by degrees expanded till it covered ground of the value, estimated in 1887, of £250,000. Throughout his successful career he was possessed with the idea of absolutely perfect accuracy. From his perfect planes he advanced to the wonderful millionth-of-an-inch measuring-machine and the standard screws and gauges which have saved an infinity of labor. When he went into business every manufacturer, or, at least, every county had its own measurement, and it was by his efforts that some approach was at last made toward uniformity. In producing standard measures of length he was at issue with authority and precedent as to the temperature at which the standard was to be of the prescribed length. The accepted temperature is 62° Fahrenheit—too low, as he pointed out, inasmuch as the mere taking of a measuring-bar in the hand must disturb its accuracy. As arms of precision were demanded, Mr. Whitworth turned his attention to the system of polygonal rifling, and suggested the hexagonal plan, which was suggested by the Martini-Henry heptagon. Knowing nothing of firearms when he commenced his experiments, he acquired, with extraordinary rapidity, such knowledge of the theory and practical performance of projectiles that his steel ordnance throwing flat-headed shot is known all over the world, and has been largely supplied to foreign governments. The steel used at his great works at Manchester is made by a process of his own for compressing the fluid metal, and expelling the air, which might otherwise produce huge flaws. Wherever iron in any form is manufactured, the name of Whitworth is held in profound respect.

To the greater world perhaps the "Whitworth scholarships" are the medium by which their founder is best known. There are thirty of them, each of the value of £100 per annum, tenable for two or three years, and were instituted for the encouragement of engineering and mechanical science.

TRADE SURVEYS

This week's reports from architects show clearly that the busy season has set in. Investors and projectors have completed their arrangements for the early months of the year, and in the wide scope of their projected operations have shown a confidence that will encourage halting enterprise wherever it exists. The possibility of overdoing is kept constantly in mind. The danger of some sudden spurt in prices will not be lost sight of for months to come. The extraordinary recuperative energies of the country on one hand, and the extraordinary expansion of consumptive requirements on the other, leave projectors, manufacturers, and dealers in a sort of quandary as to how fast or how slow to move, in order to avoid the over-production Scylla and the Charybdis of advancing prices. It is evident that the present rate of expansion of manufacturing capacity cannot be long maintained in iron and steel making. In textile manufacturing, the progress is more regular, and is held in check by foreign competition, and in some lines of goods by home competition. In the hardware industries the increase is legitimate and safe. In machinery we are progressing slowly and without the least possible danger. In agricultural-implement and wood-working machinery interests a steady increase in capacity has been going on. The shop-capacity in all sections is full, and correspondence exhibits a healthy condition for future business. Mining-operations will be conducted on a heavier scale in gold, silver, copper, lead, ore, coal, stone, and slate, and the present well-sold-up condition of the shop and mill capacity supplying such requirements shows it.

This year's railroad-building is over double last year's, and the oversold supply is quintuple last year's sales at this date. Iron and steel imports, actual and contracted for, are fully six times what they were at this date last year. Railroad-earnings are marching steadily ahead per mile, and bank clearings exhibit an increase. Commercial failures reveal a healthy commercial situation. Loans on mortgages are increasing everywhere, but the increase is for legitimate expansion rather than in vain attempts to arrest disaster.

Legislation, both national and State, is exhibiting a vigor and comprehensiveness in dealing with questions of transportation, taxation, and labor, which encourage the hope that there is virtue enough in the people to eradicate indolence. Evil tendencies are developed by the clashings of antagonistic interests. Building-interests proper are taking shape for a year of great and wide-spread activity. Manufacturers are directing their attention in many localities to the necessities of their work-people as to proper housing. Ere long the construction of small houses will become as important a feature of enterprise as the erection of a mill. This field opens opportunities for people and philanthropy. The wage-workers in this and other countries have never exhibited the necessary enterprise to build homes of their own, the daily necessities monopolizing all the earnings throughout the West, as well as in many towns in the Middle and Eastern States. Plans have been completed for the erection of blocks of houses to be rented or sold at the option of the laborers. When profits decline on products, rents on small houses will measurably compensate. The idea has been seized in the South, and factory and mill operatives are to be housed near their work at low cost. These little introductions point to important results. Then again, an influence is at work to crowd out manufacturing in certain lines into smaller towns. Labor agitations, taxation, cost of living overbalance in a great many cities, large and small, the advantages of convenience to the markets and raw material. This movement which labor agitations have precipitated will be carried much farther than the original cause intended. A geographical diversification of certain industries will develop itself to the advantage of employer and employed, and open up one opportunity to reduce the magnitude of the labor problem. Market conditions continue favorable. The strong upward tendency developed during January has been checked. The country has discounted 1887. Prices must, of necessity, be strong and demand steady. Money is abundant, notwithstanding the fruitless efforts at manipulation in the interests of lenders and speculators. English capitalists are encouraged to increase their investments in American railway securities, mines, and manufacturing enterprises. Builders are entering upon season contracts, and a spirit of activity is manifested in all sections. The New England States may not lead in building enterprise, but the investments per head of population will be very little behind even the driving West. Chicago architects and builders, or many of them, have already entered upon important engagements, and leading material-houses are under contract for supplies of all kinds. The Northwest will lead in building of all kinds, from railroad depots and grain-handling facilities down to small houses. In fact, the Mississippi Valley will house and shop itself this year with pioneer-like energy. The centre of industrial activity, like the centre of population, is moving Westward, and the magnet in the Northwest is attracting it in that direction, although the remarkable progress being made in certain sections of the South cannot be lost sight of. The building-interests nearer home, and especially along or near the Atlantic coast, will have an active year, especially in the smaller cities which are able to offer special inducements for new manufacturing enterprise. The anthracite and bituminous coal interests along the coast are promised a general improvement. Miners' wages have been advanced ten cents per ton in bituminous mines, and the anthracite miners are expecting it. This concession affects 20,000 men, and is made to insure uninterrupted production.

The American Architect and Building News

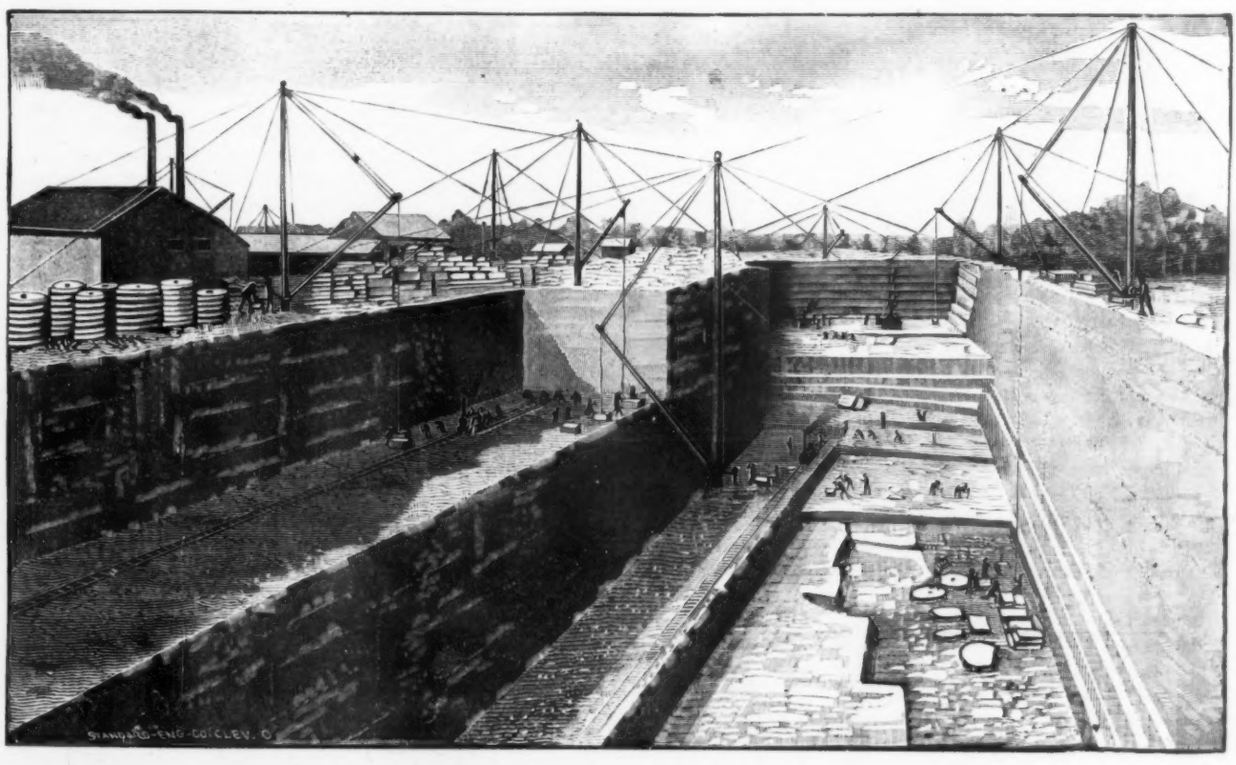
ADVERTISERS' TRADE SUPPLEMENT.

No. 57. SATURDAY, MARCH 5, 1887. VOLUME XXI. No. 584.

AMHERST AND BEREA STONE.

THE town of Berea is thirteen miles west of Cleveland, on the lines of the L. S. & M. S. R. R. and C. C. C. & I. R. R., and it is the point whence all stone called Berea stone is shipped; Amherst being twenty miles farther west. Our engraving shows one of these celebrated quarries.

The débris, or what quarrymen call the stripping, which overlays the rock, is composed of clay and blue shale to a depth of about thirteen feet. This is removed in winter by plows, scrapers and teams. Channelling-machines



are then set at work to cut a ditch, on each side of spot which has been stripped, two inches wide and ten to twelve feet deep, to a good working bed or cleavage; the third side being an open face left from the previous season's work. Steam drilling-machines then bore holes two feet apart in a line parallel with the open face, and about six feet from it. The rock is broken by plug and feather down to the bed the entire distance between the channelled faces. It is then reduced to sizes, which can be lifted by derricks, by breaking and capping. The quantity loosened by the first break is generally 3,500 cubic feet. The top layers make footing and bridge rock, and the balance being No. 1, clear, or No. 2, rock, which goes into sawed and split flagging, curbing, building-stone, grind-stones, or scythe-stones — all of the rock being utilized. The thickness of the deposit is from sixty to ninety feet. The rock being nearly all reedy, or split rock, is produced very cheaply.

At Berea the rock is of a bluish tint, while at Amherst it is both drab, or buff and blue. All blue standstones are quarried below the drainage, the buff being above. Ninety-seven per cent of this stone is silica or sand, with only the slightest trace of iron, and none of the sulphides, from which discolorations in sandstones arise.

These quarries have been extensively worked for over thirty years, producing over 16,000 car-loads per annum.

Buildings erected with it may be found in almost every town and city from Colorado to the Atlantic; State-Houses, Government, County and Municipal Structures, as well as thousands of private buildings, have been constructed of it; miles of streets are flagged and curbed with this enduring stone yearly; grind-stones, from which grits are selected that will grind anything from a pocket-knife blade to an anvil, are shipped, not only throughout this country, but to all points of the civilized world.

We own all these valuable quarries, and have issued a handsome illustrated catalogue, which we will cheerfully furnish on application.

CLEVELAND STONE CO.,
WILSHIRE BUILDING, CLEVELAND, O.

TIN ROOFING–PLATES.

IF the foundation of a building is paramount in construction, as doubtless it is, the roof which is to protect the whole edifice is only second in importance. The qualities of tin as a roofing material rank high, as may be amply proved by the great popularity it has attained during the past few years. Convenient in application, durable, and very economical, it has gained in favor, and is now employed to a far greater extent than any other material throughout the country.

Of late, tin roofing has been severely attacked on all sides. With the competition of these days, and the consequent reduction in

the price of roofing of this description, much of the material has been of far inferior quality to that produced in former years. With the lowering of price, we get a corresponding reduction in the quality of the material, so that, at the present time, the market is stocked with tin plates, many of them of so inferior a quality as to be wholly unfit for their purpose.

Under these circumstances, it is a pleasure to refer to the plates of Messrs. Merchant & Company, of Number 525 Arch Street, Philadelphia, who have also offices at New York and Chicago. This well-known house issued the first quality of plates in the market, under the name of "The Gilbertson Old Method." They are of far greater weight than usual, averaging 120 pounds for each box of IC 14 x 20, and have an extra thick coat of uniformly good quality. To prevent fraud, and guarantee that the purchaser shall get what he is paying for, each sheet is stamped with the name and thickness of the metal, and thus the owner and architect have insured the proper performance of the contract by the builder, in this important respect at least.

We have not space here to show the material gain from a pecuniary point of view, effected by the use of a good quality of roofing, but that it is the truest economy in the end there can be no doubt.

The house of Merchant & Company has long been identified with the best quality of tin plates, and no better proof could be had of the justice of this than the fact that their goods were chosen, after undergoing the most thorough and severe tests, for the White House at Washington, and this at a price higher than that of their competitors.

We have had enough of bad roofs, and more than sufficient of the grumbling of builders, owners, and architects at the poor quality of tin plates. Let them use the goods of Messrs. Merchant & Company, and see that they are properly laid, and there will be no further cause for either the one or the other.

MERCHANT & COMPANY,
525 Arch Street, Philadelphia, Pa.

Monument designed and built by Joseph Neumann, cor. 11th and Race Sts., Philadelphia, Pa.

SOMETHING NEW IN VENTILATION.

Notwithstanding the difference that exists between the thousands who have written on the subject of Ventilation, there are two facts which all recognize. The necessity for an ample supply of pure, fresh air, and the difficulty of regulating the currents, so as to make certain the object aimed at, viz., to assimilate, as nearly as possible, consistently with comfort, the condition of the air we breathe in our homes, our schools, and our workshops, with that of the outer air. Our best efforts in this direction can be but an apology for or imitation of the health-giving free atmosphere, a penalty we pay to our refined civilization.

The first difficulty referred to has hitherto been overcome by the opening of doors and windows, with the attendant draughts and other accompanying evils; yet much was borne with for the sake of breathing fresh air. There was never any question of ventilation then; but there came the question of danger to health, not from the amount of fresh air, but from the draughts and other ills attending this free manner of admission.

The paramount importance to health, and in most cases the road to the success of almost any system of ventilation, has been singularly overlooked by omitting to provide distinct inlets for fresh air to every apartment, independent of what is sometimes served up *roasted* over cockle furnaces or the unproportionate amount admitted through the seams of doors and windows. And a reduction is still being aimed at by the perfection of workmanship exhibited in our modern non-porous walls, ceilings, varnished floors, and tightly-fitting doors and windows further secured by rubber weather strips. A very few moments of thought given to a common-sense view of what we have advanced will convince our readers of its truth.

Mr. Pennycuick, a practical sanitary engineer of many years' experience on the subject of ventilation, has lately invented and patented two or three very simple devices to meet the difficulties referred to, and if their popularity during the short time they have been before the public, is any test of their excellence, it would seem as if it had been proved. We will briefly refer to them in their order and service.

The Air-Brick, of which the cut (Fig. 1) represents a horizontal section, as set in a wall, shows a cast-iron box provided with vertical traps of the form given, which, in the face of the strongest gale, so trap the current that when it reaches the apartment there is not pressure enough to affect the flame of a candle; the outer end is provided with a flanged, ornamental screen, which, in a sixteen-inch or thicker wall — the Air-Brick being eight inches — it is always advisable, if possible, to place a little lower, leaving a short vertical flue to further trap the weather, as shown in the second cut. The inside end is fitted with a quadrant valve, at an angle of about fifty degrees, (Fig. 2) which further precludes the discomfort of a draught by giving the incoming air an inclination towards the ceiling.

As it is a generally admitted fact, that a current across the ceiling has always proved a very successful method of ventilation, when the isolated position of the buildings admitted of such practice, a series of the Air-Bricks, placed at intervals in the upper part of the wall, near the ceiling line, would prove a very effective and economic mode of ventilation. In large work-rooms of such a building, it would be advisable to cap the outer end of every other Air-Brick, as shown by cut, (Fig. 3) the passage through the traps being perfectly free outward, the play of the weather on the cap would create a partial vacuum in the Air-Brick, and thus, from either point of the compass, there would be an automatic extracting power.

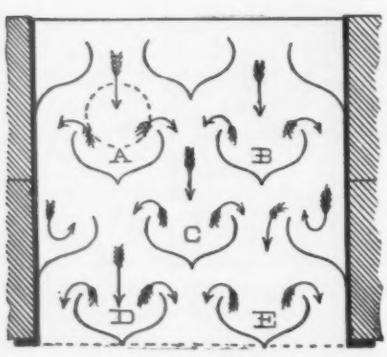


Fig. 1. Air Brick.

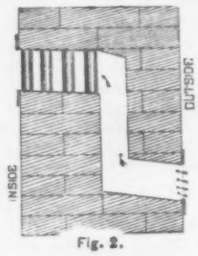


Fig. 2.

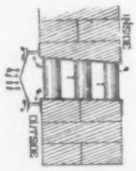


Fig. 3.

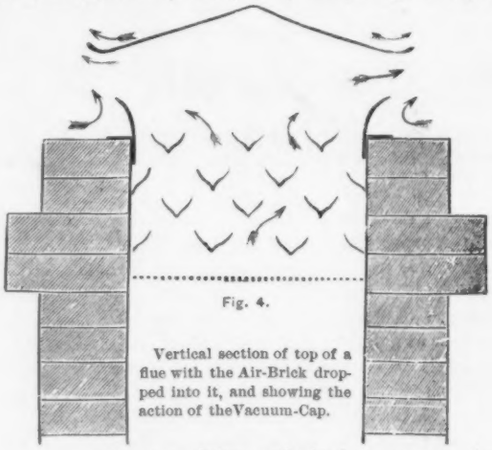


Fig. 4.

Vertical section of top of a flue with the Air-Brick dropped into it, and showing the action of the Vacuum-Cap.

Before closing our remarks on the Air-Brick,

it may not be out of place to show how successfully and unobtrusively it assumes the position so long occupied by that great regiment of monstrosities so-called ventilators or cowls, which necessity has hitherto compelled architects to adopt, greatly to the disadvantage of their designs. *Verbum sap.* The illustration (Fig. 4) speaks for itself.

The second difficulty referred to in efforts at perfect ventilation, *i. e.*, the control of the currents, which by the opening of a door, or the kindling of a fire, or some other cause, have suddenly converted the intended hot-air or upcast flue into an inlet for innumerable evils, through the ordinary ventilating register, is met very emphatically by the Pennycuick Register, as seen in the following cuts (see Figs. No. 5 and 6), the first being a plan of the Register, as

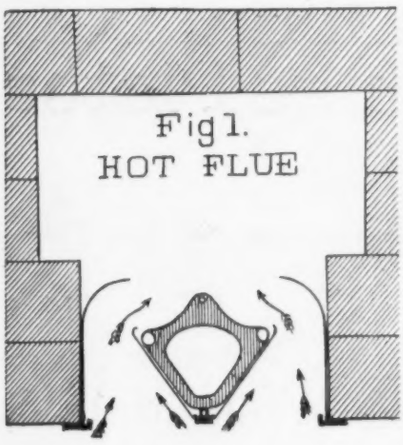


Fig. 5.

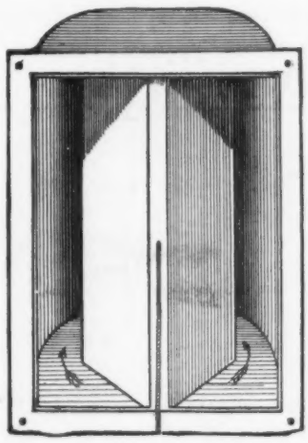


Fig. 6.

set into an ordinary flue, the second being a front view with the ornamental face removed, the principle being that of two doors hung out of plumb, which are always inclined to fall inwards, leaving a constant outlet for foul air, while the slightest movement of the air in the wrong direction is prevented by their immediately closing, opening again when the obstruction ceases.

We leave it to the intelligence of our readers to appreciate, from our brief description, the value of these devices as aids to the practical solution of the much-vexed subject of ventilation.

Mr. Pennycuick's (the inventor) advice, the result of long, practical experience in Automatic Ventilation, is always cheerfully given on application to the

AUTOMATIC VENTILATION COMPANY,
BOSTON, MASS.

CORPORATION NOTICE.

PHILADELPHIA, January 1, 1887.

NOTICE is hereby given that I have this day transferred all my right and title in the business of manufacturing art metal work, railroad car-trimmings, lanterns, reflectors, etc., to the Joseph Neumann Company, Limited, who will continue to carry on the business as heretofore.

All persons owing me will please make prompt settlement, and those having claims against me will please present them at once.

Respectfully yours,
JOSEPH NEUMANN.

PHILADELPHIA, January 1, 1887.

HAVING this day purchased from Joseph Neumann all his right, title and interest in the manufacturing business heretofore carried on by him, notice is hereby given that we will continue the business of manufacturing art metal work, railroad car-trimmings, lanterns, reflectors, etc., and solicit a continuance of your patronage. Respectfully yours,

THE JOSEPH NEUMANN COMPANY (Limited).
JOSEPH NEUMANN, *Chairman.*
G. HOWELL ARTHUR, *Secretary and Treasurer.*
GUSTAV A. MAIER, *Superintendent.*

NOTES.

THE Lidgerwood Manufacturing Company, 96 Liberty Street, New York, have just issued a new catalogue for 1887. It is replete with information concerning everything in the way of hoisting engines and apparatus, including boilers. Copies cheerfully furnished to engineers and prospective buyers.

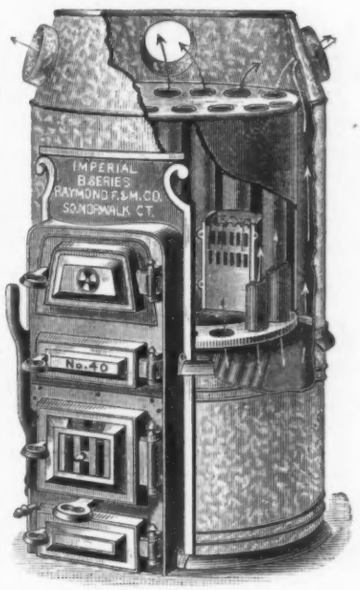
THE State of Texas, which is about completing its new capitol, will cover it with copper, using about eight hundred squares.

The Cincinnati Corrugating Company, of Cincinnati, Ohio, has the contract for this copper roof, which will be, perhaps, the largest amount on a single building in the United States.

For buildings owned by the people, not by individuals, copper is far the cheapest roofing; for, although more expensive in first cost, it far exceeds all others in durability, and does not require painting, or other repairs, if applied properly.

THE Wainwright Manufacturing Company, 65 and 67 Oliver Street, Boston, Mass., report shipments of their exhaust feed-water heaters, during the month of February, to the following places: three in Boston, one to Chelsea, one to Ayer, one to Lawrence, one to Forge Village, Mass., one to Wilmington, Del., one to Newark, one to Millville, one to Gloucester, one to Paterson, N. J., two to Washington, D. C., and one to Palatka, Fla. Their Corrugated Tube Radiators having been sent in such opposite directions as Maine and Oregon, they write that they have no reason to complain of the aspect of business, but are preparing for a busy and successful spring trade.

IMPERIAL



(CUT OF B SERIES)

FURNACES.

Revertible Flues
Automatic Gas-Valve,
Adjustable Anti-Clinker Grate,
Double Casings,
No Vertical Joints

A series, (6 sizes) all Cast-Iron.
B series, (3 sizes) Wrought Tubular Drums.
C series, (2 sizes) Steel Drums, Transverse Tubes.

STEAM, WROUGHT-IRON TUBULAR BOILERS.

Combination Steam and Hot-Air Heaters

NEW ENGLAND FAMILY RANGES,

Elevated Double Oven, First-Class, (3 sizes).

RAYMOND RANGES,

Low Oven, Brick-Set and Portable. Twenty Varieties.

All Appliances For
HEATING, COOKING and VENTILATING.
Send Plans for Estimates.

The Raymond Furnace and Manuf'g Co.,
76 Beekman St., New York.

MURPHY & COMPANY

TRANSPARENT WOOD FINISH.

Call the attention of Architects and Builders to the following grades of Varnish.

INTERIOR, $2.50 per gallon.

For interiors, on painted surfaces or plain wood. Peculiarly adapted for Hallways, Bath-rooms, Kitchens, etc., and for Floors, Walls, Ceilings in Asylums, Hospitals and Public Buildings. Its lustre is unaffected by hot or cold water, or extremes of temperature, or by the action of soap, grease, or gases.

EXTERIOR, $4.00 per gallon.

Possessing all the qualities of the "Interior," as above, but having greater durability. Intended for outer Doors and Sashes, Vestibules, and surfaces where the exposure to the elements is constant or severe. It is an absolute preventive of dry-rot and moisture.

In addition to the above-mentioned products, and to their popular and unequalled fine carriage and railway varnishes, **MURPHY & CO.** ask attention to their superior **Fine House Varnishes**, especially adapted to interior and exterior work on public buildings, churches, office-buildings, business blocks, office, and private residences. Further information and samples for trial furnished to parties interested. These grades are manufactured solely by

MURPHY & COMPANY, Varnish Makers,
227 Broadway, NEW YORK.
ST. LOUIS, 300 So. Fourth St. CLEVELAND, 566 Canal St. CHICAGO, 262 Wabash Avenue.

A. G. NEWMAN, late NEWMAN & CAPRON.

MANUFACTURERS OF

Fine Bronze Hardware, Bank, Office and Stoop Railings in Bronze or Brass. Antique Furniture-Trimmings. Electrical and Mechanical Bell-Hanging Burglar-Alarms.

Warerooms, 1180 BROADWAY. Factory, 157-163 WEST 29th STREET, NEW YORK, N. Y.

DYCKERHOFF
PORTLAND CEMENT

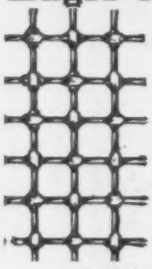
Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack. 8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington. Circular with Directions, Testimonials and Tests sent on application.

E. THIELE, 78 William St., New York.

SOLE AGENT FOR THE UNITED STATES.

L. C. HARRISON.
(Formerly Henry Erben & Co.)
CHURCH & CHAPEL
PIPE ORGANS.
260 & 262 W. 28th St., New York.

Eagle Wire-Works,
E. RATTEY,
Nos. 46, 48 & 50 West 30th St.
NEW YORK CITY.
PATENT
FLAT and EDGEWISE
WIRE-WORK,
In Brass, Iron, and Bronze,
for elevator enclosures, bank and office-railings, guards, etc. Made on an entirely new plan of flat wire set *edgewise* and interlaced or woven. New and beautiful patterns of elegant design.



Send for Descriptive Circular.
ALSO WIRE-WORK OF ALL KINDS.

Antique Hinge Plates

In Brass, Bronze & Wrought-Iron,
Furnished from Stock and made to order from designs.
Write for Illustrated Catalogue.
J. B. SHANNON & SONS, 1020 Market St., Philadelphia.

To Architects and Builders.

Adopt MAHOGANY for interior finish; it is the handsomest and most durable cabinet wood known, and we are prepared to furnish it at prices that compare very favorably with those ruling for other hard-woods.

Correspondence solicited.

Wm. E. UPTEGROVE & BRO., Foot E. 10th & 11th Sts., NEW YORK.